THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW

Vol. LXI Cleveland, December 27, 1917 *No. 26*

No Price Change Jan. 1 Says Board

President is Advised of Decision of War Industries Board and is Expected to Make Quick Announcement—Operating Conditions Show Considerable Improvement—Mills Continue to Overtake Bookings

NO CHANGES are to be made dating from Jan. 1, in the present schedule of fixed prices for iron and steel products if the President follows the recommendations of the war industries board. The latter has laid before the chief executive its formal statement suggesting that the prevailing list of agreed prices be continued to March 31, 1918. At the same time, the federal trade commission has passed up voluminous data on comparative costs of iron and steel production for October and previous months. The President is expected to take this into account in making his final decision, which is expected to be announced quickly. The war industries board recommendation clears the air of many conflicting reports as to price action. Merchant pig iron producers at a meeting in New York within the week weighed the possibilities and the results of further reductions of prices and through a subcommittee filed a protest at Washington against the consideration of any statistical table in which steelworks and merchant furnace costs were mingled.

Announcement of a long list of additional prices, extras and differentials by the general committee of the American Iron and Steel institute practically has completed the schedule of iron and steel products in conformity with the previously fixed basis on mill and furnace material applicable to Jan. 1. The new recommendations include steel castings, cast iron pipe, track supplies, hard steel bars, forging bars, cut nails and other lines. Supplementary recommendations covering iron and steel scrap have been made. Schedules still to be fixed include principally hardware products.

Operations Picking Up

Operating conditions have improved somewhat, but they are far from normal, and now holiday interruptions have contributed their part to reduced production. Extra efforts have been made by the operators in the coke districts to make the Christmas lay-off as light as possible. The urgent need of energetic measures to re-establish production is to be found in the fact that Connellsville coke shipments last week were the smallest of any week in the year. Car supply averaged 50 per cent, but this week has been started off much more promisingly. The Carnegie Steel Co. has reduced its idle furnace list from 21 to 17. At Chicago, steelmakers may be obliged to bank several furnaces, as coal reserves have been exhausted. Some production of plates has been lost through eastern mills having been obliged to shut down due to coal shortages.

Deliveries Catch Up

Mills continue to catch up in their bookings in certain lines because of priority restrictions. This however, does not apply to plates and shapes, or to semifinished material where the war demands are running high. In bars conditions rapidly are reaching a stage where the buyer is having little trouble to get shipments. Some producers, as a result, more freely are taking forward contracts. Other large buyers are following a policy aimed to put their order books into the most liquid condition. Buyers have been asked to designate what tonnages they may be willing to receive at any time, even though some of these may have been bought for shipment as much as a year from this date.

Sell Iron for Future

Pig iron buying is moving more freely into the far extended periods. Contracts for the third quarter and last half of 1918 are more numerous. Southern makers have been taking more of this future business. Prices beyond July 1, 1918, generally, are not to be subject to any subsequent revision of fixed schedules. The heavy demand for basic is constant and some large new inquiries for the second quarter have appeared, including 40,000 tons for two consumers in Pennsylvania and Ohio. Steel Corporation subsidiaries, including the American Bridge Co. and the American Steel & Wire Co., have been seeking more steelmaking metal. Due to the more adequate coke supplies, pig iron production has been considerably increased during the week.

The Iron Trade Review

EDITORIAL

Industry in Record Cost Era

PRODUCTION costs in iron and steel have been mounting rapidly for many months. This has been due to the extraordinary prices that have prevailed on raw materials and to the increase that has been shown by practically every item of manufacturing expense. The large extent of this accretion of cost generally has been realized. What it has amounted to in actual dollars and cents, however, was disclosed at the recent hearing with representatives of the producers conducted by the federal trade commission at Washington, Dec. 14. Whatever may be its influence in the determination of the question whether present iron and steel prices are to be reaffirmed or revised Jan. 1, the voluminous data then presented has served the purpose of showing concisely where and how manufacturing outlay has been raised sharply. The time was, not so many months ago, when an advance of a dollar a ton in a crude product would have brought, instanter, a searching examination of practice in every affected department and perhaps some recasting of organization lines. Nothing is so much of a fester to the well-managed mill or furnace as an inordinate increase in cost.

Conditions are materially altered at the present time, for cost expansion of several dollars a ton is accepted complacently as one of the unavoidable accompaniments of present conditions. It is not difficult to picture what would have been the consequence in other days of an increase in pig iron costs of $4 a ton between June and October, as shown at the Washington hearing by the sheets of the larger steel companies. Of a production of 2,000,000 tons in October, 84 per cent came under such an increase. This percentage of output was made at a cost of $19.86 or less, while 90 per cent was produced at $25.87 or less. The analysis of the increase in the cost of the $25.87 makers shows that the net metal charge increased about $2.50 a ton and coke an equal amount. Labor rose from 53 to 64 cents a ton. It is well to point out in this connection that since October usually is a month of heavier output than June, the labor showing per ton usually is better in the former month. Some steel companies in October made pig iron as high as $36.53, and others as low as $16.49, but the percentage in either case was small.

Northern merchant furnaces on an output of 800,000 tons revealed a low cost of $15.49 and highs of $37.39 and $39.90. The highest cost was on low phosphorus iron and the lowest on basic. Of the $37.39 cost, $19.70 was above metal, and of this, $16.03 was in coke. Of all the merchant production, 89 per cent was at $27.20 or less. One company with a total cost of $27.11 in October and $16.45 in June, showed that the net metal increased by $3.63, or from $7.49 to $11.12, and above metal, by $7.02, or from $8.97 to $15.99. Of the latter increase, coke supplied $6.21, or from $6.19 to $12.40. Of a production of 137,000 tons in October, southern merchant furnaces, including some Virginia and other producers outside of Alabama, had costs ranging from $13.10 to $30.91. About 86 per cent of the production was at $20.14 or less. The low cost in June was $12.08, and the high, $27.12. In June, 81 per cent of the southern furnaces produced at $19.99 or less. One of the large southern makers had a cost of $14.23 in October, against $13.17 in June. Its net metal charge was $3.94 in October and $4.37 in June, and the cost above metal, $10.29 in October and $8.80 in June. Coke increased $1.26, or from $5.97 in June to $7.23 in October. Labor remained constant at $1.57.

It is quite clear from these comparative figures from what direction most of the increases come. Coke has been a big factor as the difference in ore has been comparatively small. One steel company reported a coke price of $9.19, delivered, in October. A merchant maker with a high total had a cost of $16.03 in October. As against the exceedingly high prices which they have been obtaining for their product, cokemakers have undergone only a slight increase in cost. This is shown by the fact that of a production of more than 2,000,000 tons of beehive coke in October, 64 per cent was turned out at $2.82, ovens, or less. The October high cost for the Connellsville district alone was $5.03, and the low, $2.17, compared with the high level of $5.64 in June and July and a low of $2.14. It is to be noted that the high cost actually was reduced after July. The bulk of the production, however, was on a considerably lower basis in October than the bulk in June. An output of more than 1,350,000 tons of by-product coke made both by steel companies and by other companies, showed a range of $2.21 to $9.44, the latter figure not including the by-product credit. Something over 1,000,000 tons, or 79 per cent, showed a maximum cost of $5.68 per net ton.

It was brought out in connection with the coke statistics that the advance in the cost of this fuel still is far from having run its course. A large tonnage is under contract dating from July, August

The Iron Trade Review
EDITORIAL

and September, mostly for a year's period, and at prices of from $9 to $10. The statement was made also that a large tonnage will be delivered in coming months at the government price of $6, ovens. It also developed at the hearing that there have been instances where the government has reached out and taken coke sold at $10 and has sent it forward to essential industries at $6.

No such wide additions to cost as in the production of raw metal were brought out in steel works and rolling mill operations. Completely integrated steel companies, or those producing their own pig iron, made billets, blooms and slabs at a low range of $29 to $32 in October. Integrated companies produced universal plates in October at a low figure of $35.79, this including intercompany profits, and at a high of $66.85. Eighty-one per cent of production was at $48.91 or less. The low cost in June was $34.54 for sheared and universals combined. One company produced sheared plates in June at $38.38, and in October at $44.40. Of the October cost, net metal was $37.82, and items above, $6.58, compared with $32.15 and $6.23, respectively in June. The labor charge in October was $2.64, against $2.44 in May.

Integrated companies in October produced structural shapes at a low of $38.90 and a high of $52.54. The highest cost maker had a net metal cost in October of $45.79, against $32.39 in May, and a cost above of $6.75 in October, against $4.87 in May. The labor items was $2.17 and $1.84, respectively. Seventy-five per cent of the shape mills rolled under $45.17 in October, against 74 per cent producing at $38.65 or less in May or June. Of rails, 85 per cent of the production reported was at a cost of $36.47 or less.

Much of the data presented at the federal trade commission hearing will be of doubtful value in balancing up the present cost position of various producers as against that of several months ago.

The way in which the figures were presented at the hearing showed a curious mingling of costs covering different operations as branches of a single general class of production which made fair and accurate comparisons out of the question. This at least displayed a grotesque lack of appreciation of the complex character of the iron and steel industry on the part of the statisticians of the trade commission. For this reason much of what was represented to be a sizing up of similar production was in fact a comparison of divergent phases of a general class. It is evident to anyone who has followed the iron and steel industry that war business has forced various modifications of normal production and mill scheduling most of which have undermined economical operations. The figures do emphasize, however, the extraordinary conditions under which production has been and now is being carried on.

How to Get the Guns

THE additional testimony on the ordnance situation presented before the senate committee on military affairs this week brings out even more clearly than heretofore the necessity for a department of munitions, similar to the British ministry of munitions which has been urged in THE IRON TRADE REVIEW for over a year. It must be clear now to all thinking men, as it has been for months to those intimately acquainted with our army supply problem, that a radical reorganization is in order. The demand for a department of munitions is not necessarily a reflection on the war department. This arm of the government has been grievously overburdened and the new proposal suggests a division of responsibility which appears essential at this time to carry out the task with which the nation is now confronted. Army officers are not trained in business methods or purchasing principles and it is no reflection on them that things have not gone as well as they should. The trouble has been due to a faulty system all along the line. The rifle and machine gun shortages, which have been so thoroughly ventilated recently, could be duplicated in a score of other directions. In the July 12 issue of THE IRON TRADE REVIEW, for instance, a communication from a prominent steel founder detailing the difficulties of the steel-casting manufacturers with the ordnance department was published on our editorial page, with some comment. Certain army officers took exception to this communication, although it is now evident the system they were defending was more out of gear than even they suspected at the time. It would seem pertinent, therefore, to call attention once more to the suggestion contained in our editorial of July 12, which concluded with the following sentences: "This problem never will be solved satisfactorily until the business of supplying the army is placed in the hands of business men with technical and commercial training. At times like the present, would it not be more sensible to release the energies of army officers for service in the fighting contingents, leaving the task of supplying the army in the hands of men with business experience?"

Iron and Steel Prices

Corrected to Wednesday Noon

SCRAP, WAREHOUSE AND IRON ORE PRICES ON PAGE 1404

PIG IRON

Bessemer valley	$36.30
Bessemer, Pittsburgh	37.25
Basic, Pittsburgh	33.95
Basic, eastern Pa.	33.00
Basic, Buffalo	33.00
Malleable, Pittsburgh	34.45
Malleable, Chicago	33.50
Malleable, Philadelphia	34.00 to 37.50
Malleable, Buffalo	33.50

GOVERNMENT SCHEDULE

1.75 to 2.25 silicon (No. 2 foundry, No. 2 plain, and No. 3 southern) ..... $33 furnace base

2.25 to 2.75 silicon (No. 2X, No. 1 Northern foundry, and No. 2 southern) ..... base plus 50c

2.75 to 3.25 silicon (No. 1X, No. 2 soft) ..... base plus $1.50

Over 3.25 silicon ..... $34.50, plus $1.00 for each ½ per cent of silicon.

No. 1X, Phila.	35.25 to 35.50
No. 2 foundry, Pittsburgh	33.95
No. 2 foundry, Cleveland	33.95
No. 2 foundry, Ironton	33.00
No. 1 foundry, Chicago	33.50
No. 2 foundry, Chicago	33.00
No. 2X foundry, Phila.	34.25 to 34.50
No. 2+ foundry, N. J. tide	34.25 to 34.50
No. 2X foundry, Buffalo	33.50
No. 2 plain, Philadelphia	33.75 to 34.00
No. 2 plain, N. J. tide	33.75 to 34.00
No. 2 southern, Birmingham	33.00 to 33.50
No. 2 southern, Cincinnati	36.40
No. 2 southern, Chicago	37.50
No. 2 southern, Phila. del.	38.30 to 39.40
No. 2 southern, Cleveland	37.50
No. 2 southern, Boston	39.50
No. 2 southern, St. Louis	35.90
Virginia, No. 2X, furnace	33.50
Virginia, No. 2X, Phila.	36.77
Virginia, No. 2X, Jersey City	37.02
Virginia, No. 2X, Boston	37.27
Silveries, 8 per cent, furnace	46.00
Silveries, 8 per cent, Chicago	48.54
Low phos. standard, Phila.	55.00 to 56.00
Low phos. Lebanon furnace	50.00
Low phos., Pittsburgh	53.00
Charcoal, Superior, Chicago	37.50
Charcoal, Superior, Buffalo	39.75
Charcoal, southern, furnace	43.00

COKE

(At the ovens.)

Connellsville furnace	$6.00
Connellsville foundry	7.00
Wise county furnace	6.00
Pocahontas furnace	6.00
New River foundry	7.00
New River furnace	6.00
Wise county foundry	7.00

FERRO ALLOYS

Ferromanganese delivered	$250.00 to 255.00
Spiegel, 20 per cent fur.	60.00
Ferrocarbon titanium, carloads, maker's plant	160.00
Ferrosilicon, 50 per cent, Pittsburgh	175.00
Ferrosilicon, 50 per cent, Pitts., 1st quarter	160.00 to 170.00
Bessemer ferrosilicon, 9 per cent.	$51.70
Bessemer ferrosilicon, 10 per cent.	55.00
Bessemer ferrosilicon, 11 per cent.	58.30
Bessemer ferrosilicon, 12 per cent.	61.60

Ferrosilicon prices at Ashland, Ky., Jackson and New Straitsville, O.

SEMIFINISHED MATERIAL

BILLETS

Open hearth, Pittsburgh	$47.50
Open hearth, Philadelphia	50.50
Open hearth, Youngstown	47.50
Bessemer, Pittsburgh	47.50
Bessemer, Youngstown	47.50
Forging, Pittsburgh	60.00
Forging, Philadelphia	63.00

SHEET BARS

Open hearth, Pittsburgh	$51.00
Open hearth, Youngstown	51.00
Bessemer, Pittsburgh	51.00
Bessemer, Youngstown	51.00

WIRE RODS AND SKELP

Wire rods, Pittsburgh	$57.00
Grooved skelp, Pitts.	2.90c
Sheared skelp, Pitts.	3.25c

SHAPES, PLATES AND BARS

(In cents per pound)

Structural shapes, Pitts.	3.00c
Structural shapes, Phila.	3.185c
Structural shapes, N. Y.	3.195c
Structural shapes, Chicago	3.00c
Tank plates, Chicago	3.25c
Tank plates, Pittsburgh	3.25c
Tank plates, Philadelphia	3.435c
Tank plates, New York	3.445c
Bars, soft steel, Pittsburgh	2.90c
Bars, soft steel, Chicago	2.90c
Bars, soft steel, New York	3.095c
Bars, soft steel, Phila.	3.085c
Bar iron, Chicago	3.50c
Bar iron, Philadelphia	3.685c
Bar iron, Cleveland	3.64c to 3.70c
Bar iron, New York	3.695c
Bar iron, Pittsburgh	3.50c
Hard steel bars, Chicago	3.00c
Cotton ties, Pitts., Dec.	$2.17

RAILS, TRACK MATERIAL

Angle bars, Pittsburgh, base	3.25c
Angle bars, Chicago, base	3.25c
Standard bessemer rails, mill	$38.00
Stand open hearth rails, mill	40.00
Light rails, 25 to 45, mill	3.00c
Relaying rails, light, St. L.	75.00 to 80.00
Spikes, railroad, Pittsburgh	3.90c
Track bolts, Pittsburgh	4.90c
Track bolts, Chicago	4.90c
Tie plates, Chicago	3.25c

WIRE PRODUCTS

(Per 100 lbs. to jobbers; retailers 5c more)

Wire nails, Pittsburgh	$3.50
Coated nails, Pittsburgh	3.45
Plain wire, Pittsburgh	3.25
Galvanized wire, Pittsburgh	3.95
Polished staples, Pittsburgh	3.65
Galvanized staples, Pittsburgh	4.35
Barb wire, painted, Pittsburgh	3.65
Barb wire, galvanized, Pitts.	4.35
Cut nails, Pittsburgh	....

CHAIN, PILING, STRIP STEEL

(In cents per pound)

Chain, ⅜ in. proof coil, Pitts. 8.00c

Sheet piling, base, Pittsburgh 4.00c to 5.00c

Cold rolled strip steel, hard coils, 1½ inches and wider by 0.100 inch and heavier, base per 100 pounds, 6.50c.

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SHEETS

(In cents per pound.)

SHEET MILL BLACK

No. 28, open hearth, Pitts.	5.00c
No. 28, bessemer, Pitts.	5.00c
No. 28, open hearth, Chic.	5.215c

TIN MILL, BLACK

No. 28, open hearth, Pitts.	5.00c
No. 28, bessemer, Pitts.	5.00c

GALVANIZED

No. 28, open hearth, Pitts.	6.25c
No. 28, bessemer, Pitts.	6.25c
No. 28, open hearth, Chic.	6.465c

BLUE ANNEALED

No. 10, open hearth, Pitts.	4.25c
No. 10, bessemer, Pitts.	4.25c
No. 10, open hearth, Chic.	5.715c to 6.215c
No. 10, open hearth, Phila.	4.435c

TIN PLATE

(Per 100 lb. box)

Tin plate, coke base, Pittsburgh $7.75

IRON AND STEEL PIPE

Base Pittsburgh

Base Pittsburgh	Black Per cent off	Galv. Per cent off
⅛ to 3 in., butt, steel	51	37½
¼ to 3 in., butt, iron	33	17

BOILER TUBES

Steel, 3½ to 4½ inches, l. c. l.	30
Iron, 3½ to 4½ inches, c. l.	12½

CAST IRON WATER PIPE

(Class B Pipe.)

Four-inch, Chicago	57.50
Six-inch and over, Chicago	54.50
Four-inch, New York	58.35
Six-inch and over, New York	55.35
Four-inch, Birmingham	52.00
Six-in. and over, Birmingham	49.00

Class A pipe is $1 higher than Class B.

HOOPS, BANDS, SHAFTING

Hoops, Pittsburgh	3.50c
Bands, Pittsburgh	2.90c
Shafting, Pittsburgh, carloads	17 off to list

RIVETS

Structural rivets, Pittsburgh	4.65c
Boiler rivets, Pittsburgh	4.75c
Rivets ⅞ in. and smaller, Pitts.	45 and 10 off

NUTS AND BOLTS

(Delivered within 20-cent freight radius.)

CARRIAGE BOLTS

(⅜ x 6 inches, smaller and shorter)

Rolled thread	50–5 off
Cut thread	40–10–5 off
Larger and longer	40 off

MACHINE BOLTS

(⅜ x 4 inches, hot pressed nuts)

Rolled thread	50–10–5 off
Cut thread	50–5 off
Larger and longer	40–10 off
Cold pressed semi-finished hexagon nuts ⅝ in. and larger	60–10–10 off
Cold pressed semi-finished hexagon nuts ⅞ in. and smaller	70–5 off
Gimlet and cone point lag screws	50–10 off

NUTS

Hot pressed, square blank	2.50c off
Hot pressed, square tapped	2.30c off
Hot pressed, hexagon blank	2.30c off
Hot pressed, hexagon tapped	2.10c off
Cold pressed, square blank	2.25c off
Cold pressed, square tapped	2.00c off
Cold pressed, hexagon blank	2.25c off
Cold pressed, hexagon tapped	2.00c off

Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago.)

Quotations on leading products December 26, average for November 1917, average for September 1917, and average for December, 1916. Prices are those ruling in the largest percentage of sales at the dates named

	Prices Dec. 26, 1917.	Average prices Nov., 1917.	Sept., 1917.	Dec., 1916.
Bessemer pig iron, Pittsburgh..	$37.25	$37.25	$48.27	$35.95
Basic pig iron, Pittsburgh.....	33.95	33.95	43.95	30.95
*No. 2 Foundry pig iron, Pitts.	33.95	33.95	48.95	31.70
*No. 2 Foundry pig iron, Chic.	33.00	33.00	49.50	29.25
Lake Superior Charcoal, Chicago	37.50	37.50	59.50	32.00
Malleable, Chicago	33.50	33.50	49.50	29.25
**Southern, No. 2, Birmingham.	33.50	33.50	43.50	23.00
*Southern Ohio No. 2, Ironton.	33.00	33.00	49.50	30.00
Basic, eastern Pa.....	33.00	33.00	49.50	30.00
**No. 2X Virginia, furnace....	33.50	33.50	50.75	26.00
**No. 2X foundry, Philadelphia.	34.00	34.00	53.25	29.50
Ferro mang., delivered.....	250.00	247.00	378.00	160.00
Bessemer billets, Pittsburgh....	47.50	47.50	73.75	58.75
Bessemer sheet bars, Pittsburgh	51.00	51.00	82.50	58.75
Open hearth sheet bars, Pitts..	51.00	51.00	82.50	58.75
Open hearth billets, Pittsburgh.	47.50	47.50	73.75	58.75
Steel bars, Pittsburgh.....	2.90	2.90c	3.725c	2.925c
Steel bars, Chicago.....	2.90	2.90c	4.10c	3.10c
Iron bars, Philadelphia.....	3.685	4.335c	4.935c	3.059c
Iron bars, Cleveland.....	3.64	4.00c	4.50c	3.00c

*1.75 to 2.25 silicon. **2.25 to 2.75 silicon.

	Prices Dec. 26, 1917.	Average prices Nov., 1917.	Sept., 1917.	Dec., 1916.
Iron bars, Chicago mill.....	$3.50	4.10c	4.50c	2.85c
Beams, Chicago	3.00	3.00c	4.46c	3.20c
Beams, Pittsburgh	3.00	3.00c	3.75c	3.025c
Beams, Philadelphia	3.185	3.185c	4.435c	3.409c
Tank plates, Pittsburgh.....	3.25	3.25c	6.8125c	3.525c
Tank plates, Chicago.....	3.25	3.25c	7.33c	3.75c
Tank plates, Philadelphia.....	3.435	3.435c	7.75c	4.159c
Sheets, blk., No. 28, Pittsburgh	5.00	5.30c	8.75c	4.50c
Sheets, blue anld., No. 10, Pitts.	4.25	4.60c	8.50c	4.00c
Sheets, galv., No. 28, Pittsburgh	6.25	6.50c	9.6875c	6.25c
Wire nails, Pittsburgh.....	3.50	$3.50	$4.00	$3.00
Connellsville fur. coke.....	6.00	6.00	9.625	4.44
Connellsville fdy. coke.....	7.00	7.00	12.50	6.00
Heavy melting steel, Pittsburgh	30.00	29.60	35.50	25.00
Heavy melting steel, eastern Pa.	29.00	27.50	31.25	24.00
Heavy melting steel, Chicago...	30.00	28.50	32.65	23.35
No. 1 wrought, eastern Pa.....	35.00	35.70	44.50	27.00
No. 1 wrought, Chicago, net ton	31.00	30.60	36.25	25.35
Rerolling rails, Chicago.....	35.00	35.70	41.25	29.50
Car wheels, Chicago.....	29.00	27.50	31.00	21.85

(For Additional Prices See Page 1404)

Banked Blast Furnaces Resuming

Freer Movement of Coke Due to Milder Weather Brings Some Improvement in Operating Conditions—Carnegie Steel Co. Has 17 Stacks Idle—Heavy Inquiry for Extending Forward Delivery Still Appears

Pittsburgh, Dec. 25.—Moderate weather of the past week having afforded freer movement of coke to blast furnaces operations have improved considerably. They are far from being normal, however. The Carnegie Steel Co. has 17 furnaces out for lack of coke and two down for repairs, as against 21 out of 59 which were out of blast the latter part of last week. The loss of pig iron during 1917 on account of a lack of coke has amounted to several millions of tons, according to well informed trade authorities. While open inquiries for pig iron have decreased, there continues to be a great deal of quiet sounding of the market. However, little tonnage is being offered in the valleys district, which are committed for the first quarter and the first half. Foundry operations have been restricted greatly owing to the inability to obtain iron. This also has caused a marked shortage of steel, and numerous plants in this district as a result will take occasion to close down part of the present week to make greatly needed repairs. Furnaces report that difficulty is being experienced in making shipments on contracts owing to the railroad situation, although it has improved somewhat. While they appear to be in a much better position than recently in the way of fuel supplies, there is no assurance that the railroads will be able to continue to keep them stocked.

Want Much First Half Iron

New York, Dec. 22.—Actual inquiries now before the trade here call for at least 25,000 tons of foundry iron for first half. Including tonnages which are not under actual inquiry but which melters would be glad to purchase if they could be had, it is estimated that fully 50,000 tons of first half foundry could be disposed of without delay. Among the active first half inquiries are at least two of 5000 tons each for New Jersey consumers and many smaller ones from New Jersey, Connecticut and New York state foundries The American Locomotive Co. has not yet succeeded in purchasing the 2900 tons of foundry which it wants for first half shipment to its Richmond, Va., plant. None of the northern furnaces apparently bid on this inquiry and indications are that the iron may be obtained either from Virginia or Alabama furnaces, preferably the latter, if shipment can be arranged. Considerable inquiry also is out for the second half foundry, but the furnaces are chary about booking this business and are taking only occasional tonnages for second half from regular customers. Second half business entered this week included only a few thousand tons. Several New York state melters continue to find it impossible to get malleable excepting for an occasional carload. Most of them consequently have had to depend on mixtures of other grades. A New Jersey melter recently resold several thousand tons of basic for immediate shipment to the Pencoyd plant of the American Bridge Co. The Worthington Pump & Machinery Corp. is in the market for 1000 tons of charcoal iron for delivery, 200 tons monthly, commencing in February.

Corporation Companies Inquiring

Philadelphia, Dec. 24.—Large inquiries for basic continue to be put out by various consumers, principally the American Bridge Co. for its Pen-

coyd plant, and the American Steel & Wire Co. for its Worcester plant. With the exception of a few hundred tons, mainly off iron, however, these inquiries are bringing out no offers since sellers already have as much tonnage on their books as they have hopes of delivering. Sales of all grades during the past week involved comparatively little tonnage in the aggregate. Inability to get iron has caused consumers to inquire less actively. Current inquiry for foundry alone, however, calls for at least 15,000 tons. Output in the east has been cut considerably as a result of the storm. Inability to move cars has resulted in increasing the scarcity of coke and operations at several stacks have been halted temporarily because of lack of fuel.

Coke Conditions Very Bad

Buffalo, Dec. 24.—The situation as regards pig iron in this district shows a brisk demand and a strong market but practically no iron. A famine condition prevails with almost every melter in the market for metal. Many melters need a great deal of iron and everyone needs a little. They are not getting it. Infrequently old customers whose needs are desperate are satisfied, but only infrequently. It looks as if there will not be any iron in this district for shipment prior to July 1, 1918. Buffalo district furnaces are operating but barely so. Coke conditions continue as bad as ever, though some users look for a little better situation regarding fuel after the first of the year. But they concede that this depends wholly on weather conditions. Foundry, malleable, basic and bessemer—consumers want all grades, and the inquiry ranges from a couple of hundred tons up to 1000 tons. There isn't any doubt among producers that with government price restrictions inoperative, the market price of iron would be $70 or $80.

Little Business Done

Boston, Dec. 24.—Conditions in pig iron have not changed materially during the past week. As far as demand goes, the market is active, but with almost no prompt or nearby iron available. The furnaces are sold up through the first quarter and in some cases through the first half of next year and most of them are adverse to booking contracts for the last half, so that actual business is light. Occasional lots, which sometimes run as high as 200 tons, constitute the bulk of the current local sales. Most of the trade is looking for the lull which usually comes at the end of the year and not a few of them, if not most of them, will welcome it, for it will give them a chance to go over their books and get a line on how and where they stand. There are contracts of six and eight months' standing which have not yet been completed. A chance to cast up accounts and devise ways and means of getting these orders out of the way is what sellers would like. That buyers are likely to be less keenly interested during the next week or two is probable from the fact that this is the season for inventories. Stock-taking this year is hardly the simple matter it formerly was, for this year war taxes have to be figured. Another reason for a possible tapering off in the demand is that this territory is looking to Washington for action on iron prices. There is a desire to wait to see what action, if any, will be taken Jan. 1. The transportation situation is still bad in this territory. No Connellsville coke has been offered locally during the past week; deliveries on old contracts are slightly better than they have been, but still below demand.

Eastern Pig Iron Rates Raised 15 Per Cent

New York, Dec. 24.—Freight rates on pig iron in eastern territory have been advanced 15 per cent, effective Dec. 6. The railroads did not send out new tariffs until early last week and some of the new rates still are to be announced. As a result, considerable iron was sold on a delivered basis at the old rates. Some of the new rates are as follows:

Lehigh Valley furnaces—90c to Philadelphia, Newark and Jersey City; $1.40 to New York and Brooklyn; $2.20 to New England.

Schuylkill Valley—$1.10 to Newark, Elizabeth and Jersey City.

Lebanon Valley—$1.30 to Newwark, Elizabeth and Jersey City; $1.90 to New York and Brooklyn; $2.20 to Troy, Albany and Schenectady.

Erie—$2.90 to Philadelphia; $2.80 to Baltimore; $3.10 to Newark, Elizabeth, Jersey City, New York and Brooklyn, and Troy, Albany and Schenectady; $3.30 to New England.

Western Pennsylvania—$2.10 to Newark; $2.20 to Elizabeth and Jersey City; $2.90 to New York and Brooklyn; $3.10 to New England.

Buffalo—$3 to $3.10 to New York and Brooklyn; $2.10 to Paterson and other points formerly taking $1.84 rate, and $1.40 to all points formerly taking $1.26 rate.

Lebanon Valley—$1.30 to Newark, Elizabeth and Jersey City; $1.90 to New York and Brooklyn; $2.20 to Troy, Albany and Schenectady.

More Basic Wanted

Cleveland, Dec. 24. — Additional heavy inquiries for basic are coming out especially for the second quarter. One steelmaker in western Pennsylvania and another in Ohio have appeared in the market for that position with inquiries totaling 40,000 tons. Much basic tonnage for earlier position which recently was circulated still is unsatisfied. New foundry iron demand for far forward delivery also is considerable. A number of additional sales of this grade for the last half of 1918 have been made at $33, furnace, and are not subject to any later revision of fixed prices. Some malleable also has been sold for the second half of 1918 under the same provisions at $33.50, furnace. The 3000 tons of foundry and malleable for the Westinghouse Electric & Mfg. Co. plant at Essington, Pa., which recently was asked under government auspices, practically has been distributed.

Forward Sales Being Made

Birmingham, Ala., Dec. 24.—Pig iron production in the south is being well maintained, but with difficulty. Sales of iron now are being made for delivery through the third quarter of 1918, and consideration is being given to business through the last half of next year. A few small sales still are being made for the first half of 1918. Government prices obtain on all of the business now being booked. Indications point to the probable make for the third quarter of the year will be sold out by April 1, and before July 1 there will be a scarcity of iron for delivery over the balance of the year. Furnace stocks of iron in southern territory remain unchanged. The railroad car situation and embargoes still are severe and but little improvement is to be noted in deliveries. Furnaces generally will be kept in steady operation through the holiday season. Raw materials supplies have been stocked ahead. Labor has promised to lose as little time as possible and to make every effort to increase output of mines, quarries and ovens.

Inquiries are numerous for iron for last half of the coming year. Basic,

in particular, is being asked for. Charcoal iron is moving fairly well. Home consumption shows no change as yet, though cast iron pipe business is not up to expectations.

Foundries Expecting Trouble

Cincinnati, Dec. 24.—The short coke supply has caused the banking of many furnaces and has greatly aggravated the pig iron situation. The holiday season, following the bad weather of the previous week, tends to delay shipments. So far not much inconvenience has been experienced by foundry melters, but they are anticipating trouble at any time. Bad fuel has caused the production of much high sulphur iron especially in the south, but the furnaces apparently are able to ship the grade of iron wanted on old contracts, but new buyers must take what they can get.

Chicago Practically Bare

Chicago, Dec. 24.—Northern makers of pig iron are out of the market except that an occasional carload can be placed and tonnages of off iron are offered from time to time. Merchant furnaces continue to obtain sufficient fuel and no imminent danger of running short has presented itself. Northern makers have sold their entire output to the middle of 1918. Some inquiry for last half iron is being received and occasional tonnages are being placed, but this business is not heavy. Most southern makers are out of the market, but one or two interests continue to take business for first quarter and first half. Lake Superior charcoal iron is well sold to the middle of 1918 and some small business is being placed for last half delivery. Inquiry for all kinds of iron is heavy but buyers find difficulty in placing business. Some large basic needs are in the market and an inquiry for 1000 tons of charcoal iron for a pump manufacturer is being considered.

Inquiries Still Increase

St. Louis, Dec. 24.—Growing shortage of pig iron was clearly indicated this week by increasing inquiries in the hands of St. Louis dealers. As has been the case for a month or more, the inquiries are from points well outside of the usual local territory, and many of them are of a character denoting urgent needs. A thorough canvass of leading consumers in the St. Louis district elicited the information that to date no one has suffered for want of supplies. Only in a few instances, and these with smaller plants, has it been necessary to even curtail operations. All larger mills are covered by contracts.

Coke Movement is Better

Milder Weather Results in More Adequate Car Service—Early Operations of Carnegie Steel's New By-Product Plant Will Help Situation

Pittsburgh, Dec. 24.—Mild weather has resulted in a better movement of coke to blast furnaces and the car supply in the Connellsville region has improved greatly, although it is not possible to say how long the more favorable situation may continue. Hope is entertained that both the supply and movement of cars can be maintained on a more satisfactory basis, but by reason of the uncertain weather conditions at this time of year it cannot be foretold what may develop. Operators have taken measures to keep to a minimum the interruptions to production over the Christmas holiday. The general car supply last week in the Connellsville region averaged 50 per cent, the average on the Monongahela railroad being 48 per cent. On the Pennsylvania yesterday there was a 100 per cent supply and on the Monongahela 90 per cent. Numerous furnaces which have been without coke are now well supplied and operations have increased considerably in consequence, but are far from normal. The Carnegie Steel Co. expects late in March or early in April to have the first half of its battery of 1280 by-product ovens at Clairton, Pa., in operation. This half, or 640 ovens, will have an annual capacity of 2,000,000 tons of coke. In the spring of 1919 it is expected to have the second half in operation, so that the capacity then will be 4,000,000 tons annually. This will take care of all of the blast furnaces of the Carnegie company and will be a big factor in relieving demands on railroads. The coal will be moved to the by-product plant by river and the coke output of the entire plant will represent about 300 cars daily, which will be released to the railroads. Inquiries for coke continue to be insistent, although with the better movement they are less pressing. Some furnaces which have yet to cover fully are unable to place contracts. Smaller operators have considerable unsold fuel, which they are indifferent as to selling. Production in the Connellsville region for the week ended Dec. 15 totaled 285,347 tons as compared with 307,903 tons for the preceding week, according to the *Connellsville Courier*.

Furnaces Need Coke

Cincinnati, Dec. 24.—A question of much importance concerns the ability of producers to furnish the furnaces sufficient coke to keep them going. This situation appears to be as serious in the south as in southern Ohio. Oven operators claim that an insufficient coal supply is not the only trouble with which they have to contend. Labor is very scarce and unreliable, being more so during the holidays, and reports as to the car shortage are not at all exaggerated. The Connellsville district is about the only one where future contracts can be made.

Can't Fill Official Requests

St. Louis, Dec. 24.—Users of coke in this general region have been bestirring themselves actively to arrange for next year's supplies. Results of their efforts to date have been extremely unsatisfactory. Dealers have nothing to offer, and it becomes daily clearer that there are not going to be supplies sufficient to go around unless conditions change shortly. In addition to urgent demands from customers, and the trade at large, dealers this week have received telegrams and letters from the fuel administration at Washington, and those of the states of Texas, Kansas, Illinois, Missouri and Oklahoma asking that they ship anywhere from one to 16 cars of coke to given points. In spite of the authority back of these semidemands, the dealers have been obliged to answer that nothing could be done.

Demand in South Strong

Birmingham, Ala., Dec. 24.—The same condition prevails in the south as to coal and coke. Though production is greater, there is a stronger demand and the need is more urgent. All probabilities of trouble in the mining fields have been overcome. An agreement has been reached whereby the United Mine Workers of America, Alabama district No. 20 accept the proposals as worked out by the federal fuel administration. By these the operators grant eight hours a day, checkweighmen, rights to present grievances through committee and arbitration, if necessary, readjustment of wages in July next and other points. Penalty clauses are included in the proposals. Employes throughout the coal fields will be urged to greater efforts towards a larger production of coal. Coke ovens are being worked to capacities with some trouble being experienced by reason of lagging coal supplies.

Shortages Blocking Scrap

Lack of Supplies Still the Governing Factor of the Market—Prices Show Upward Tendency in Various Districts

FOR COMPLETE SCRAP PRICES SEE PAGE 1404

New York, Dec. 22.—Large tonnages of heavy melting steel were sold by New York dealers this week to a number of eastern Pennsylvania consumers. The largest buyer was the Lukens Steel Co., which apparently took at least 10,000 tons here. This business resulted in advancing the market which now is quoted at $25.50 to $26.50, New York, for No. 1 heavy melting steel. Active demand also featured wrought scrap which was taken in fair-sized tonnages by a number of eastern Pennsylvania mills. Cast scrap also has enjoyed a much more active demand than usual. Nearby foundries have taken large quantities of cast scrap and continue in the market for this grade, which they are anxious to get due to the scarcity of pig iron. In addition to heavy melting steel, the dealer's price here on wrought pipe has been advanced to $29.50, and mixed borings and turnings to $14.50. On clean cast borings, prices have declined to $17. Difficulty in moving freight owing to the recent severe snow storm, caused both the New York Central railroad and the Central Railroad of New Jersey to declare embargoes temporarily. Neither of these roads are accepting any scrap shipments.

Scarcity More Acute

Buffalo, Dec. 24.—The market for scrap continues just as strong as last week, with the added feature that the scarcity of all grades of scrap is becoming more apparent. This is particularly true of heavy melting steel. With any kind of a supply, and railroad conditions right, dealers probably could do a big business, but unfortunately the railroad situation is not improving. Embargoes appear to be in force for all point dealers care to ship and it is almost impossible to get equipment. Gondolas are not to be had at all.

Traffic Conditions Still Bad

Boston, Dec. 24.—The market in old material is very firm, with a big demand and moderate supplies. Trouble still is had in getting supplies to customers, for the railroad situation, on account of recent weather conditions, still is bad. Wholesale dealers' paying prices per gross ton, f.o.b. shipping points, follow: Wrought No. 1 yard long, $29 to $30; horseshoes, $28 to $29; cotton ties, $20 to $21; stove plate, $19 to $20; No. 1 machinery, $33 to $33.50; No. 2 machinery, $28 to $29; car axles, iron, $43 to $44; steel, $43 to $44; rerolling rails, $34 to $35; relaying rails, $50; iron boiler plate, $34 to $35; bundled barrel hoops, $17.50 to $18; wrought iron pipe, new specifications, $24 to $25; steel rails, $25 to $26; No. 1 railroad steel, $25 to $25.50; heavy melting steel, $24 to $25; axle turnings, $18 to $19; machine shop turnings, $12.50 to $15; cast borings, $17 to $17.50; drop forge trimmings, $21 to $22; cast iron car wheels, mill price, $30 to $32.

Shortage More Pronounced

Pittsburgh, Dec. 24.—Shortage of scrap in this district has become more marked. Dealers report that they are unable to obtain sufficient tonnages to take care of requirements of mills. The sources of supply appear to be narrowed considerably and the situation is complicated by reason of railroad embargoes, which prevent a free movement of shipments. At the same time the claim is made that some dealers have available stocks but are making no offerings. It is evident that there are sellers who take no interest in the market. They assert that it is not possible to get scrap at prices below those at which they are compelled to sell as a result of the fixed levels that have been established. On four grades, heavy melting steel, No. 1 railroad wrought, cast borings and machine shop turnings, the selling prices, f.o.b. consuming points, are quoted in accordance with those recommended by the American Iron and Steel institute, while conforming levels apply to the other grades. Demand is active for most grades and is especially insistent for heavy melting steel and low phosphorus billet and bloom ends. The market for cast borings and machine shop turnings is rather dull.

Supply Short of Demand

Cleveland, Dec. 26.—Although demand for iron and steel scrap is heavy in this territory, and dealers are making efforts to satisfy requirements of their customers, the market is not particularly active in the matter of actual transactions and is not expected to improve much in this respect until after the holidays. Supplies appear to be far short of requirements, although producers, most of them, are selling their scrap almost as fast as it is made. Quotations remain practically unchanged and are expected to remain so at least until the middle of next week. Transportation conditions could hardly be worse and prospects for immediate improvement are not favorable.

Cincinnati Conditions Dull

Cincinnati, Dec. 24.—In the face of very dull conditions scrap prices have not been lowered. Small advances have been made on a few grades, but the maximum prices quoted would be hard to obtain. The dealers are not yet able to make shipments to many consuming points except in carload lots for which priority orders have to be obtained in many instances.

Chicago Scrap Higher

Chicago, Dec. 24.—Though the scrap market is quiet at the holiday season, there is some buying and the tendency of prices is distinctly upward. The leading interest has been taking heavy grades of scrap for its mills and has paid up to $30 for some of it. This is the limit of price set by the government. The same price has been reached by shoveling steel and other heavy grades interchangeable with heavy melting. Stove plate and cast scrap also have advanced, as they are in strong demand to make up for the shortage of pig iron. Car wheels are practically absent from the market. Either they are being applied on conversion agreements or are being sold direct by railroads. In the present shortage of pig iron, they are in great demand. The Chicago, Rock Island & Pacific offers a list of 2700 tons, including 1000 tons of rails, and the Chicago, Milwaukee & St. Paul, 2000 tons.

Southern Scrap Market Firmer

Birmingham, Ala., Dec. 24. — The southern scrap iron and steel market is a little firmer. Representative dealers say if there were sufficient railroad cars to bring in country scrap and deliver material to consumers, there would be a very satisfactory activity. Dealers in the south are not in the least apprehensive of any revision of schedule of prices by the government. A request has been put in from this section that if there is to be any change that the quotations be made f.o.b. selling point, and not at place of consumption. Traffic difficulties prevent business with Philadelphia, St. Louis and Chicago, which are inquiring freely. H. I. Goldstein

has sold his entire yard supply to the McKnights of Columbus, Ga. Southern consumption of old material is somewhat better and a higher price is being paid by the buyers.

Sheets Lacking

Domestic and Export Inquiries Lighter at Youngstown.

Youngstown, O., Dec. 26.—No large tonnages have been placed with the sheetmakers in this district the past week although large volumes of inquiries continue to come out from domestic buyers. Export inquiry, however, has fallen off considerably. Only small tonnages are wanted by domestic consumers and a few contracts have been made to the regular trade. One sales manager states this past week he has turned down hundreds of tons of orders, even though all called for small tonnages, because he did not have the material to supply the demand. This producer has been out of the galvanized market for about three weeks and has now withdrawn from the market entirely. The leading producer of sheets in the valley who has been out of the galvanized market for about a month has now come in again. Some mills are not eager to contract beyond the first quarter in view of the existing shortage of sheet bars. The shortage has become extremely acute of late, the production having been threatened due to the coal shortage.

Sell Forward Allotments

Pittsburgh, Dec. 24.—Demand for sheets is fairly active and is expected to increase soon now that the automobile industry shows signs of becoming interested in the market. Manufacturers of sheets have sold all the tonnages allotted for the first half in the case of black and blue annealed grades, and of galvanized sheets for the first quarter. Requirements have been confined to consumers who are engaged in the production of essentials. Mills approach the New Year with operations restricted to perhaps 65 per cent of capacity, a condition that is due to a shortage of steel.

Demand Exceeds Supply

Chicago, Dec. 24.—Strong demand exists for all grades of steel sheets, greater than mills can accommodate. The leading independent is able to take some small tonnages of blue annealed for first quarter delivery, but is out of the market for black and galvanized. Government work accounts for a large part of the tonnage on books at present, but private consumers are in need of much material.

More Shell Steel Placed

Recent Government Awards Reach Many Thousand Tons—Cast Steel Shells Are Placed as Substitute for Forgings

New York, Dec. 24.—More than 100,000 tons of shell steel have been awarded to various mills by the government during the past week. Some of these allotments were as follows: Midvale Steel & Ordnance Co., 45,000 tons; Lackawanna Steel Co., 40,000 tons; Bethlehem Steel Co., 16,000 tons, and Allegheny Steel Co., 15,000 tons. Government contracts for about 62,000 tons of round-edge billets for shells recently have been taken by the Brier Hill Steel Co. The Bethlehem Steel Co., which recently took a contract for one-pounder shells for the French government, has sublet portions of this contract to other companies and altogether 1920 tons of 1⅞-inch cold-rolled shafting have been bought for this work.

Difficult to Buy Steel

Pittsburgh, Dec. 25.—While inquiries continue to be made for billets and sheet bars, they have decreased because consumers realize there are no offerings. Production has been curtailed considerably owing to the shortage of pig iron and in view of requirements made by the government for open-hearth steel, this grade is being furnished to it at the expense of domestic consumers who are being given bessemer billets to apply on contracts. The sheet output promises to be affected sharply through the lack of sheet bars, but it is hoped to adequately supply bars to tin plate makers to take care of requirements in connection with the food conservation program. Makers of wire rods are well committed for the first quarter and are able to take only limited tonnages. One mill which has been out of the market for soft rods for some time is now sold up on high carbon rods. Inquiries are coming from both domestic and foreign buyers.

Cold Rolled Strip Dull

Pittsburgh, Dec. 25.—Dullness continues to characterize the market for cold rolled strip steel. Mills are operating at about 70 per cent of capacity, according to producers. This will be increased considerably if makers of automobiles and other consumers become active in the market again, as it is expected they will do in the near future.

Sheet Bar Inquiry Continues

Cleveland, Dec. 24.—Considerable inquiry for sheet bars for nearby and foreign deliveries is coming out regularly. Consumers, however, are having difficulty in supplying their wants owing to the heavy demand for semifinished steel that is being made upon the mills for urgent war business. A local sheet mill is in the market for 1000 tons of sheet bars for quick shipment.

Place Cast Steel Shells

Philadelphia, Dec. 24.—Cast steel shells are being relied upon by the government to a growing extent as substitutes for shell forgings. During the past two weeks the American Steel Foundries have taken a contract for 56,000 tons of such castings and the Scullin Steel Co. for 28,000 tons.

Seasonal Slack

Boston Steel and Iron Demand Slow

Boston, Dec. 24.—Jobbers in steel and iron products have found business somewhat quieter during the past week than it had been previously, but the decrease is ascribed more to the season of the year than to any lack of needs on the part of buyers. There has been no change in prices since the recent reductions to the quotations ordered by the government. Warehouse quotations, ex carting charges, follow: Flat bars and bands, 6 inches and narrower in stock lengths, 4.115c, base; rounds and squares, 1⅞-inch and smaller, in stock lengths, 4.115c, base; 1 15/16-inch and over in stock lengths, 5c, base; flats, 1⅛-inch and thicker and not over 6 inches wide, 5c, base; wider than 6 inches and thicker than 1 inch, 6c, base; wider than 6 inches and not even inches, but fractions of an inch in width, 6c, base; angles and channels, under 3 inches, in stock lengths, 4.115c, base; angles, channels and beams, 3 inches and over, in stock lengths, 4.215c, base; tees, under 3 inches, in stock lengths, 4.265c; 3 inches and over, 4.75c, net; hexagons, 5.50c, base.

The Taylor Welder Co., Warren, O., has been organized by A. C. Taylor, A. E. Hackett and J. H. Ewalt to manufacture electric welders. These tools are designed to weld metal of thickness greater than one-quarter inch and may be operated on a multiphase current, thus offsetting any tendency to unbalance the line.

Large Bars Grow Scarce

Heavy Occupation of Mill Capacity by Shell Rounds Reduces Supply for Open Market—More Contracting is Continuing

New York, Dec. 24.—Due to the extensive contracts for shell rounds which have been let by the government recently, the output of the larger bar mills is so taken up that it is becoming exceedingly difficult to obtain even small tonnages of merchant steel bars longer than 2 inches. It is only the smaller sizes, rolled by the mills not pressed into the output of shell rounds that can be had with comparative ease. Fair-sized sales of such bars for quick shipment have been made during the past week at 2.90c, Pittsburgh.

Hard Bar Contracts Expected

Chicago, Dec. 24.—Hard steel bars present about the only feature in this market, as buyers and sellers have been waiting for the announcement of the fixed price before entering into contracts. Now that this has been established at 3c, mill, considerable buying is expected. Likewise, some changes in selling practice probably will be put in effect by makers. Steel bars are difficult to obtain, though the leading interest recently took some contracts for delivery at convenience, in order to make some regular customers feel more comfortable. Some eastern mills are offering fairly prompt delivery on bars as well as other finished steel. Specifications are heavier than usual, though most of this is for government use. Curtailment of operations on the part of the leading interest seems imminent on account of increasing fuel difficulties. Coal now is practically a day-to-day affair and shortening of production seems inevitable. Bar iron is quiet, but a meeting of wagon manufacturers was held here last week, which resulted in general inquiries for material for an additional order for transport vehicles. This has not become definite, but promises to bring out more tonnage for early delivery.

Take First Quarter Contracts

Cleveland, Dec. 24.—A number of first quarter contracts in steel bars and shafting are being made with manufacturing buyers in this district. This business largely is in bessemer steel as open hearth is being taken on very sparingly by producers. Among the purchasers are several of the farm implement manufacturers. Some additional tonnage of this class now is pending. The official fixing of the 3c, mill, price on hard steel bars is in line with the expectations which have been entertained in the trade in this territory.

Bar Iron Market Improves

Pittsburgh, Dec. 25.—Improvement is reflected in the market for common iron bars. Active buying from all classes of consumers is reported by producers. Mills are not committing themselves beyond the first quarter. Business is being taken at the fixed price of 3.50c, Pittsburgh, and demands call for capacity operations, but some plants have been compelled to curtail output owing to a shortage of fuel. Wages of puddlers based on actual sales will be figured on a 3.50c card after manufacturers have filled old contracts and are booked exclusively at the regulated level. The present card, effective Nov. 1, is based on the prevailing sales price of 2.85c, for September and October, calling for a wage of $13.80 a ton. A 3.50c card would call for an increase of $3.25 over the existing schedule or $17.05 a ton. The market for muck bar is quiet. Makers of agricultural implements are fairly well covered for their steel bar requirements and so far have not figured actively in the Pittsburgh market for 1918 business. Some producers have accepted limited tonnages of steel bars for first quarter delivery at the government price of 2.90c, Pittsburgh.

Selling Implement Trade

New York, Dec. 24.—The leading interest is reported to be taking on some contract business in bars for the agricultural implement manufacturers at 2.90c, Pittsburgh. These sales have been made especially in the Chicago district as reported in THE IRON TRADE REVIEW last week.

Shafting Buying Light

Pittsburgh, Dec. 25.—Orders being placed by the government for cold rolled shafting are not so large. Domestic buying also is limited. Hesitancy in placing requirements is shown by the automobile and screw stock machine industries whose output has been curtailed somewhat. It is improbable that they will figure conspicuously in the market for some time inasmuch as both have diverted portions of capacities to war work. Sales of cold rolled shafting are being made at the fixed level of 17 per cent off, Pittsburgh.

Fix New Chain Base

Pittsburgh, Dec. 25.—Fixing the base price on 1-inch chain instead of ⅜-inch, some makers have issued new differentials. This change brings about a higher level than that of 8c, fixed on ⅜-inch sizes, proof coil, Pittsburgh, by the American Iron and Steel institute committee. It is the purpose of makers who have revised the base price to sell to the government at the regulated figure but because raw material they have on hand was obtained at cost in excess of prices subsequently fixed by the committee, it is understood the prices established for the government cannot be quoted to domestic consumers. Extras are the same in both lists, twist link, 3/16 to 7/16-inch inclusive being 50c, while the BB grade is 1.25c extra and BBB 1.75c.

The revised list and that recommended by the institute committee follows:

	Revised list	Recommended list
⅛	14.70	12.10
¼	11.45	9.55
⅜	10.20	8.55
½	9.20	*8.00
⅝	8.95	7.85
½ and ⅝	8.70	7.70
⅝	8.60	7.60
¾	8.50	7.50
⅞	8.40	7.40
1	*8.30	7.30
1⅛ and 1¼	8.40	7.40

*Base.

Nuts and Bolts Active

Pittsburgh, Dec. 25.—Brisk buying of nuts, bolts and rivets by domestic consumers has developed during the past week. Steel and railroad companies are figuring prominently in new business taken. Sales are being made at prices recently fixed. This is understood to leave a narrow margin of profit for makers by reason of the fact that steel bar tonnages used apply on contracts closed at open market prices before the level of 2.90c, Pittsburgh, was established. These contracts will expire in a month or so, after which nut, bolt and rivet manufacturers expect to get material.

Hoops and Bands Quiet

Pittsburgh, Dec. 25.—The market for hoops and bands is quiet. Makers are fairly well covered on contracts and no sales of importance are reported.

Accident and sickness clauses are included in the group life insurance plan recently inaugurated by the

Bridgeport Brass Co., Bridgeport, Conn., for its employes. The plan calls for a sickness or disability benefit of one-half the employe's wages, up to a certain maximum, for a period of not to exceed 26 weeks, for which he is asked to pay monthly dues of 25 cents. Insurance policies from $500 to $1000 are issued free of cost.

Cast Pipe Prices

Are Adjusted to Conform with New Official Fixed Level

New York, Dec. 26.—The fixing of the price on cast iron pipe at $49, Birmingham, for 6, 8 and 10-inch, Class B and heavier, establishes the delivered prices at New York at $55.35 for the above sizes and $58.35 for 4-inch, Class B. On Class A pipe, the new prices, delivered at New York, are $56.35 for 6, 8 and 10-inch, and $59.35 for 4-inch. This level is approximately $1 higher than the prices which have been prevailing here of late. It therefore is considered likely, especially in view of the fact that cast iron pipe makers now are not exceptionally active, that competition will bring out quotations lower than the maximum. The volume of business in cast iron pipe in this district fell off considerably during the past week, although inquiry has continued to come out from private sources. No contracts yet have been placed for the cast iron pipe requirements of Jersey City and Baltimore. The export inquiries which were referred to last week have not yet been closed.

Wrought Pipe is Dull

Pittsburgh, Dec. 25.—The seasonal dulness prevails in the market for pipe and mills are engaged in taking inventories. New business is coming chiefly from jobbers, who sell to industrial concerns, railroads and oil country consumers. Jobbers who supply plumbers are showing but little interest in the market, making no active inquiry. Most of the new business involves lap-weld iron and steel pipe and delivery can be made in two months by some mills producing iron pipe of this class.

Chicago Cast Pipe Lower

Chicago, Dec. 24.—A reduction of $1 in the price of cast iron pipe to $54.50, Chicago, for 6-inch pipe, which is the new agreed price, has been announced. The United States Cast Pipe & Foundry Co. has been awarded 170 tons by Jackson, Mich. Tentative inquiry is being made by Quincy, Ill., on 400 tons for next year. Winnipeg and Madison, Wis., will open bids Jan. 4 on pipe for 1918.

Want Higher Plate Price

Eastern Producer Declines to Accept Futher Claiming 3.25c Figure is Below Cost—Tonnage Goes Unsatisfied—Many Boilers Placed

Philadelphia, Dec. 24.—A leading eastern Pennsylvania plate maker, after submitting cost data to the federal trade commission last week showing an appreciable loss on all plate orders booked at the government maximum of 3.25c, Pittsburgh, has decided to take no more business either from the government or other buyers unless permitted to charge a price high enough to cover manufacturing outlay. This maker will complete all contracts already booked, however, which will require until about July 1. Big inquiries for plates continue to come out from car, boat and tank builders. In one case a car builder asked for 30,000 tons last week. All of this business is being turned away. One mill has booked some further first quarter tonnage for regular customers. During the week the Emergency Fleet corporation placed further plate tonnage for shipment to fabricators who have contracts for ship steel for the American International Shipbuilding Corp.

Limited Tonnage Offered

Pittsburgh, Dec. 25.—Few mills are making offerings of plates to domestic consumers. One large producer in this district, however, is taking bessemer plate business at the fixed price and is making deliveries in a comparatively few weeks. Government requirements continue to increase and are making heavy demands on producers. Car builders are receiving about 60 per cent of their needs, but owing to a labor shortage at some of the plants the movement is sufficient to cover present requirements. The Pressed Steel Car Co. recently took 300 underframe cars from the Louisville & Nashville railroad. Inquiry from railroads is light.

Ship Boilers Placed

Cleveland, Dec. 24.—A contract for 420 water-tube boilers for merchant vessels for the Emergency Fleet corporation upon which various boiler shops in this district were competing recently has been placed with the Babcock & Willcox Co. The total steel requirements of this order are placed at 15,000 to 20,000 tons. It is expected an inquiry for several hundred additional boilers of the same type will be put out by the Fleet corporation later and many smaller shops likely will receive portions of this. Eastern mills continue to make some sales around 3.33c, mill, for universal plates, and 3.60c, mill, for sheared plates, but deliveries are falling back steadily. Shipments have been further extended by the cutting-off of production through coal shortages. A leading Pittsburgh producer has been offering bessemer tank plates for three to four weeks' shipment at the fixed price of 3.25c, Pittsburgh.

Awarding Ship Material

Chicago, Dec. 24.—Orders from the government for plates to be fabricated in structural shops for the shipbuilding program continue to come out, though in small individual tonnages, according to the capacity of the individual fabricator. The aggregate is large and the mills have much tonnage ahead of them. Demand for plates for private consumers is strong, but there is little opportunity for this to be met. Some eastern makers are said to be able to take some business and to give reasonable deliveries on small tonnages.

Heaviest Tonnage

In History is Contracted for in Tin Plate for 1918

Pittsburgh, Dec. 25.—Tin plate requirements for the first half are fully covered and exceed those of any previous period year in the history of the industry. Demands made in connection with the food conservation program are extremely heavy, but the mills will be easily capable of taking care of all the business coming to them provided there is no interference in any way of car and steel shortage. Government requirements call for open-hearth steel, and this has caused some producers to take care of domestic contracts by rolling from bessemer sheet bars.

Sell For First Half

Philadelphia, Dec. 24.—Pittsburgh mills have taken on considerable first half tin plate tonnage during the past week. This business, which was restricted to regular customers, went at the government price of $7.75, Pittsburgh, per base box.

The Bowen Anchor Co., Morton, Pa., is building a 100 x 230-foot foundry.

Destroyer Steel Placed

Bethlehem Shipbuilding Corp. Distributes 15,000 Tons of Shapes for Warcraft—Stock Extra is Abandoned by Mills

New York, Dec. 24.—Relatively few tonnages now are pending in the eastern structural market. Perhaps the largest tonnage to come before the attention of fabricators is that of the E. W. Bliss Mfg. Co., which is in the market for 5500 tons for its proposed machine shop in Brooklyn. Terry & Tench, New York City, also are negotiating on about 1100 tons of fabricated steel for a viaduct in the Grand Central aera, in this city. It was reported that this tonnage had been let to the Phoenix Bridge Co., appears to be unfounded. Action of 700 tons of steel for an addition to Wanamaker's store in New York City has been postponed until after the first of the year.

Eastern shape mills who recently were charging an extra 50 cents per 100 for shipment out of stock, have abandoned this method of quoting. Business now is taken either at 3c, Pittsburgh, for delivery at mills convenience, or, where the seller has warehouse facilities, at 4.195c, New York. Outside of direct or indirect government work, structural tonnage is so scarce that an order for 100 tons of plain shapes is considered large. Although mills still have plenty of business on their books, one or two of them are reaching the point where they would like to take on some more tonnage. Standard sections can now be had for delivery in five or six weeks and special sections even sooner. On special sections a differential 10c per 100 pounds continues to be asked. This differential, although not announced by the American Iron and Steel institute committee, is considered as proper in view of the fact that several months ago when the special price of 2.50c was fixed on plain shapes involved in the naval program, such a premium was allowed.

Western Demand Still Light

Chicago, Dec. 24.—Demand for structural shapes in this district is growing lighter for buildings, cars and bridges, but some compensation is obtained in tonnages asked by the government from bridge shops for shipbuilding. These tonnages continue to be placed regularly and are widely distributed over western territory in order to insure prompt deliveries. Such other structurals which have been placed recently are in small tonnages. An effort has been made to delay construction of the new union station in Chicago until after the war to conserve the supply of steel for other uses.

Distributes Destroyer Tonnage

Philadelphia, Dec. 24.—The Bethlehem Shipbuilding Corp., through the American Iron and Steel institute, has distributed orders during the past week for some 15,000 tons of shapes for the construction of 45 torpedo boat destroyers by the Fore River plant of the former interest. The structural market is dead as far as lettings are concerned and no new projects have come up for bids. Plain shapes continue to sell in occasional small tonnages at 3c, Pittsburgh, for shipment in about two months.

Mills Booked Far Ahead

Pittsburgh, Dec. 25.—The structural market continues to be extremely dull so far as domestic business is concerned and there are no indications of its becoming active soon. Government requirements are occupying the chief attention of fabricators. Some are committed far into next year, and the leading interest is booked for almost all of 1918. The market for small sections is especially tight.

CONTRACTS PENDING

Machine shop for the E. W. Bliss Co., Brooklyn, 5500 tons, bids being taken.

Work in Grand Central area, New York city, 1100 tons, bids being taken by Terry & Tench, contractors.

Addition to Wanamaker's store, New York, 700 tons, postponed.

CONTRACTS AWARDED

Craneway for Curtis & Co. Mfg. Co., St. Louis, 100 tons, to Stupp Bros. Bridge & Iron Co., St. Louis.

Bridge over state barge canal at Tonawanda, N. Y., 400 tons, to Scherzer Roller Lift Bridge Co.

Acquires Engine Works

Toronto, Canada, Dec. 22.—The Dominion Bridge Co., of Montreal, has acquired a controlling interest in the International Engineering Works, Ltd., of Amherst, N. S., formerly the Robb Engineering Co. The new subsidiary will be used in connection with the manufacture of marine engines, which has been recently undertaken by the Dominion company. It is at present engaged in the manufacture of stationary engines, boilers and munitions. Six of the directors of the Dominion Bridge Co. have been elected directors of the International Works as follows: Phelps Johnson, G. H. Duggan, F. L. Wanklyn, J. M. McIntyre, H. H. Vaughan and A. J. Brown. G. W. Cole, a former director of the old board, has been appointed secretary-treasurer.

Russian Cars

Under Manufacture Not To Proceed—Light Rails Still Active

Chicago, Dec. 24.—Some inquiry is now current for railroad cars, though there is not much activity. The Illinois Central railroad seeks figures on 1000 hoppers and 300 flat cars and the St. Louis & San Francisco railroad is asking for 170 steel underframes. The inquiry of the Chilean state railway for 1100 cars of various kinds is still before makers but not much headway is being made in placing it. It is stated that work has been stopped on several thousand cars destined for Russia. It is believed that export of these cars would be held up pending settlement of difficulties in that country.

The Cambria Steel Co. has taken an order for 75 tank cars for the Butterworth-Judson Co.

Light Rails in Demand

Pittsburgh, Dec. 25.—Jobbers in the Pittsburgh and West Virginia districts are specifying freely against contracts for small spikes. At present 5c, base, Pittsburgh, is quoted on 5½-inch x 9/16-inch spikes, 5.50c base on ½-inch, 6c base on ⅜ x 7/16-inch and 7c base on 5/16-inch. The market for standard spikes is quiet. The standard steel rail market is also unchanged. Makers still withhold quoting on 1919 business and are committed for 1918. Small tonnages of light rails for prompt delivery are being sold. Manufacturers are not anxious to accept this business, which is being taken at the government price of 3c, Pittsburgh, on sizes 25 to 45 feet. However, they are in a position to take care of requirements and inasmuch as discard steel may be used in making this product, they are not suffering from a shortage of rolling material.

The Rockford Malleable Iron Works, Rockford, Ill., has added 80 Howe trucks to its equipment for handling its material and product. The Abell-Howe Co., 565 West Washington boulevard, Chicago, furnished these trucks and also has taken a contract for high-speed chain for 23 drives at the plant the Continental Can Co. is building at Clearing, Chicago, Ill.

Recommend Prices Be Reaffirmed

War Industries Board Advises President Against Any Change in Present Schedule Jan. 1—Cost Data Also Submitted by Federal Trade Commission—Merchant Pig Iron Makers Make Protest

WASHINGTON, Dec. 22.—Only as President Wilson directs will any changes be made in the present prices on iron ore, coke, pig iron and semifinished and finished steel products. The war industries board today voted to continue the present quotations until March 31, 1918, when they again become subject to revision. This decision means they will not be revised Jan. 1, as provided when prices were first fixed, unless the President sees fit to make some changes.

President Gets Cost Report

The October production cost report of the federal trade commission was submitted to the President Friday. This was one week after several steel men were called in by the commission to discuss the costs as compared with those on which the present prices were adjusted. On Saturday Joseph E. Davies of the commission and J. Leonard Replogle, director of steel supply, sat with the war board and went over the costs with the members.

Along with the cost report was submitted special communications from approximately 100 producers, big and little, in practically all lines affected by the prices. In addition there were presented memoranda of merchant pig iron men and small steel producers objecting to being put on the same basis with large producers and companies with fully integrated plants.

Merchant Iron Producers Object

Commissioner Davies, on Friday, met a committee of merchant pig iron makers, who, on behalf of the manufacturers of their class, pointed out the unfairness of any recommendation to the war industries board based on a table of costs in which merchant and steel works furnaces were mingled. It was pointed out that many of the steel companies control their raw materials and that their position was radically different from that of the merchant furnaces which are obliged to buy ore, coke and other supplies. It was suggested that the government, in order to insure the full production of merchant furnaces, should entertain the advisability of allowing a special price for merchant pig iron.

The committee was informed that the commission considered the merchant pig iron costs separately from the steel pig iron costs, even dividing the merchant class into northern and southern sections. The merchant furnacemen were instructed to reduce their objections to writing.

The committee presenting the case of the merchant pig iron producers consisted of T. W. Friend, of the Clinton Iron and Steel Co., Pittsburgh; Seymour Wheeler, of the Federal Furnace Co., Chicago; D. F. Croxton, of the Cleveland Furnace Co., Cleveland; John B. Guernsey, of the Old Dominion Pig Iron Corp., Roanoke; J. E. Perry, of the Wharton Steel Co., Wharton, N. J.; Edwin N. Rich, of the Alabama Co., Birmingham; and Frank Baird, of the Buffalo Union Furnace Co., Buffalo. The appearance of this committee at Washington followed a general meeting of merchant iron producers at New York, at which two-thirds of the furnaces of this class in the country were represented. Consideration was given to the government's requirements and to the evolving of such plans as would expedite the filling of these requirements. The rapid increase of ironmaking costs, the precarious coke supply and other subjects received attention.

The action of the war industries board today was without the preliminary of a conference with steelmakers as was the case when prices on ore, coke, pig iron, plates, shapes and bars were agreed as disclosed in the President's announcement Sept. 24, on billets, blooms, slabs, sheet bars, skelp, wire rods and shell bars in the announcement of Oct. 11, on wrought steel pipe, cold rolled steel, sheets, tin plate, wire and scrap on Nov. 5, and one various extras as subsequently announced by the American Iron and Steel institute. Representative steel men sat with the board two weeks ago but prices were not discussed.

Coal Tests Are Reported to be Satisfactory

Washington, Dec. 24.—The fuel administration is gratified by reports from Reading, Pa., of tests made by the Carpenter Steel Co., in an effort to save coal. That company experimented with a mixture of anthracite culm and bituminous coal, and, according to Fuel Administrator Garfield, the experiment was successful. By using natural draft on a mixture of 20 per cent culm and 80 per cent bituminous, the company obtained a boiler rating of 100 per cent and an efficiency rating of 70 per cent. Use of a forced draft on a mixture of 35 per cent culm and 65 per cent bituminous, a boiler rating of 115 per cent and an efficiency rating of 76 per cent were obtained. The administration is hoping other industrial plants will follow up this test as a means of saving fuel.

Ferro Strong

Around $250, Delivered, and Other Alloys are Holding Firmly

New York, Dec. 22.—Demand for ferromanganese and spiegeleisen at present is restricted to occasional small tonnages. On ferromanganese, the market continues strong at $250, delivered. On spiegeleisen, the market may be quoted at $60, furnace. Fifty per cent ferrosilicon also is quiet, but continues firm at $175 for prompt shipment and at $160 to $170 for first half.

Seek Ferroalloys Tonnages

Pittsburgh, Dec. 25.—Inquiries for small lots of 50 per cent ferrosilicon and 80 per cent ferromanganese are coming to producers and brokers in this district. The market for spiegeleisen is quiet. Tonnages of these grades are limited. Twenty per cent spiegeleisen continues to command from $60 to $65, furnace, for prompt delivery. Fifty per cent bessemer ferrosilicon and 80 per cent ferromanganese for early shipment are quoted at $175, Pittsburgh, and $250, delivered, respectively. Contracts for 50 per cent ferrosilicon for first quarter delivery have been closed at $170, which is considered to be representative of the market.

Ferro Market Strong

Chicago, Dec. 24.—Inquiry is being received for ferromanganese and one round tonnage now is under consideration for second or third quarter delivery. If this is closed it will mean that the local producer has little further to offer for first half.

More Fixed Prices Are Announced

Institute General Committee Makes Further Important Recommendations Which Include Steel Castings, Cast Iron Pipe, Track Supplies, Rerolled Bars, Forging Billets and Other Lines—Supplemental Rulings on Scrap

FURTHER recommendations of prices covering a number of miscellaneous iron and steel products have been recommended for adoption by the general iron and steel committee of the American Iron & Steel institute. The new list covers steel castings, cast iron pipe, railroad fastenings and track supplies, including spikes, angle bars, tie plates, belts and splice joints, reinforcing bars rolled from steel rails, cut nails, forging ingots, and cast iron slugs for projectiles. Recommendation to supplement the base prices on iron and steel scrap, differentials on pig iron containing over 0.04 phosphorus and extras for forging bars also are announced.

Chairman E. H. Gary, of the committee on steel and steel products of the institute, in announcing the further recommendations, said: "Referring to the statements of the chairman of the committee on steel and steel products of the American Iron and Steel institute, dated Nov. 13 and Nov. 20, 1917, recommending prices for certain steel products, to be adopted as maximum prices, to take effect immediately, to apply to the requirements of the United States government, to the war requirements of the allies and for domestic consumption within the United States, the committee now makes similar recommendation to the iron and steel industry in respect of the prices below stated. The committee also recommends to the industry that the additional extras and differentials below stated be adopted, to take effect immediately. The committee expresses the hope that there will be no hesitancy in accepting the above recommendations."

IRON AND STEEL SCRAP

No. 1 Heavy Melting Scrap

The maximum price of $30 per gross ton f. o., b. consumer's works shall apply to all grades of iron or steel scrap to be melted, which normally sold at or under the price of No. 1 heavy melting steel scrap, including malleable cast scrap of all kinds, and cast iron scrap of all kinds, including iron car wheels.

A special charge of not to exceed $3 per gross ton may be paid for cutting heavy melting scrap to sizes 18 inches and under in length.

Steel rails 56 pounds per yard and heavier, 5 feet and over in length, suitable for rerolling purposes, may be purchased at a differential of not more than $3, over the base price of heavy melting steel scrap, provided the purchaser currently operates mills for rerolling such rails.

Parties operating acid open-hearth furnaces, or crucibles, converters or electric furnaces making tool steel or steel castings, may pay a maximum of $19 per gross ton over the base price of heavy melting scrap, for scrap guaranteed not to exceed .04 in phosphorus and .04 in sulphur. Such parties may also

(*Concluded on page 1372*)

ROLLED STEEL ANGLE SPLICE BARS

For standard sections steel tee rails, 50 pounds per yard and heavier.
25 gross tons or more, standard sections, which do not involve new roll equipment, per 100 pounds f. o. b. makers' mill, base $3.25
Less than 25 gross tons, subject to special arrangement.

Extras per 100 Pounds

For Quality		Annealing	For workmanship Hot working	Oil quenching
Low carbon, open hearth or bessemer	Base	$0.10	$0.10	$0.20
Medium carbon, open hearth or bessemer	$0.15	.10	.10	.20
High carbon, open hearth or bessemer	.10	.10	.10	.20
Extra high carbon, open hearth	.15	.10	.10	.20

For Special Analysis

For sulphur specified in bessemer steel 0.075 or higher ..... $0.05 per 100 pounds
For sulphur specified in open-hearth steel 0.06 maximum ..... .05 per 100 pounds
For sulphur specified in open hearth steel 0.05 maximum ..... .10 per 100 pounds
For phosphorus specified in open hearth steel 0.03 maximum ..... .045 per 100 pounds
These prices do not apply to patented angle splice bars and joints, which will be subject to special negotiation.

STANDARD RAILROAD TRACK BOLTS

Standard button head, oval neck, 3½-inch and longer by ¾-inch and larger, with United States standard square nuts and rolled threads, 200 kegs of 200 pounds each, or more per 100 pounds, f. o. b. cars Pittsburgh, base $4.90
Less than 200 kegs ..... $1.00 per 100 pounds extra

Extras Per 100 Pounds

Diameter	Length, inches	Square nut	Hexagon nut
1¼ to ¾ inches	3½	Base	$0.30
	3¼	$0.20	.40
	3	.30	.50
	2¾	.40	.60
⅝ inch	3½	.30	.55
	3¼	.35	.60
	3	.40	.65
	2¾	.50	.75
	2½	.60	.85
	2¾	.75	1.00
⅞ and ½ inch	3	.85	1.30
	2¾	1.00	1.45
	2½	1.15	1.60
	2¼	1.20	1.75
	2	1.35	1.90
	1¾	1.55	2.10
	1½	1.65	2.25
⅞ inch	2½	1.55	2.00
	2¼	1.75	2.20
	2	1.95	2.40
	1¾	2.15	2.60
	1½	2.35	2.80
¾ inch	2¼	2.40	2.95
1 x 1 x ⅛-inch and larger angles, channels, flats and cultivator beams			Base
	1¾	2.90	3.45
	1½	3.15	3.70

Bolts with cut threads ..... $0.10 per 100 pounds
Bolts with square recessed nuts ..... .10 per 100 pounds
Bolts with ideal square recessed nuts ..... .15 per 100 pounds

RAIL STEEL BARS

Rolled From Old Steel Rails

Base price, per 100 pounds f. o. b. makers mill $3.00

Extras For Size Over 100 Pounds

Rounds, squares and flats, including deformed bars and twisted squares take regular steel bar extras.
1 x 1 x ⅛-inch and large angles, channels, flats and cultivator beams ..... Base
U bars, regular channels, hollow I bars, diamonds, triangulars, 1½ x 1½ x ⅞-inch and larger tees, ¾ x ¾ x ⅛-inch and heavier, 1 x ⅝ x ⅛-inch and heavier angles $0.10
1 x 1 x ⅞-inch to 1¼ x 1¼ x ⅞-inch tees 0.20

For Cutting to Length

No extra charge for lengths 24 inches and over; under 24 inches subject to negotiation.
These prices do not apply to special sections which will be subject to special negotiation.

FORGING INGOTS

Basic or Acid Open Hearth Steel Per Gross Ton

Up to and including 36 inches diameter, with carbon not over 0.25 cast in chilled molds f. o. b. makers' works, base $73.00

Extras for Size

Over 36-inch diameter to and including 50-inch diameter, add to base price $4.00
Over 50-inch diameter to and including 60-inch diameter, add to base price 8.00

Extras for Carbon

Over 0.60 carbon, add to base price 2.00
Over 0.25 to and including 0.60 carbon, add to base price $1.00
For sand cast ingots, add 10.00
Dimensions of hexagonal or octagonal ingots to be measured over flats.
These prices do not apply to ingots in which nickel or other alloys are specified which will be subject to special negotiation.

Government Prices on Steel Castings

	Per 100 lbs.
Column bases, bridge blocks and shoes	$7.00 to 7.75
Add $2 each for test bars in excess of two bars per heat.	
Boiler castings and fittings (light section)	13.65 to 41.50
Boiler castings and fittings (heavy section)	11.60 to 35.80
Flange castings	10.55 to 28.75
Engine castings	8.40 to 35.55
Add ½c per pound if over 0.40 carbon is specified.	
Old style anchor castings	10.60 to 17.85
Add ½c per pound for chemical or physical test. Other tests to be paid for by customer.	
Propeller wheels	11.10 to 35.90
Cement mill castings	9.20 to 21.30
Gears, pinions, segments, racks, worms, worm wheels, sprockets, sheaves and pulleys	8.05 to 30.20
Add ½c per pound if over 0.40 carbon is specified.	
Add ½c per pound if physical test is specified. Add for alloys, the usual extras.	
Crane castings	8.95 to 31.85
Mine and industrial car castings	8.20 to 21.70
Mine and industrial car wheels	7.70 to 11.35
Freight car castings of standard American design.	7.95 to 22.75
Patterns to be furnished free of charge by the foundry when more than 500 castings are ordered from each pattern at one time.	
Freight car castings of foreign design	10.95 to 20.60
Patterns to be furnished free of charge by the foundry when more than 500 castings are ordered from each pattern at one time.	
Miscellaneous railroad castings	8.70 to 19.70
Rail or step joint castings	10.50
Refractory and brick yard castings	10.75 to 29.85
Jaw and gyratory crusher castings	7.55 to 31.45
Add for jaw crusher frames made in one piece and gyratory crushing housings, 20 per cent.	
Road and mining machinery castings	8.15 to 34.50
Miscellaneous Locomotive Castings:	
Driving wheel centers	$7.70
Engine frames under 2000 pounds each	11.20
Engine frames over 2000 pounds each	8.20
Extras Per Pound for Alloy Steel:	
Nickel steel, 2½ to 3½ per cent	$3.50
Vanadium steel, approximately 0.18 per cent.	2.50
Chrome steel, approximately 1 per cent chromium	1.50
Chrome nickel steel, approximately 1 per cent chromium and 2 per cent nickel	4.00
Chrome vanadium steel, approximately 1 per cent chromium and 0.18 per cent vanadium.	4.00
Titanium steel	1.50
Rolling Mill Steel Castings:	
Prices for rolling mill castings are subject to these discounts:	
25 cents per pound, under 750 tons per year.	
45 cents per pound, from 750 to 2000 tons per year.	
65 cents per pound, from 2000 to 7500 tons per year.	
75 cents per pound, over 7500 tons per year.	
Except that annealing boxes and annealing bottoms, charging boxes, and charging box heads and ends are subject to a discount of only 25 cents per pound when total requirements amount to less than 7500 tons and only 35 cents per pound when total requirements amount to more than 7500 tons.	
Prices Per 100 Pounds	
Rolls, unfinished	$7.70 to 11.80
Usual extras to be added for carbon over 0.50 and other alloys.	
Pinions, unfinished	8.05 to 13.55
Usual extras to be added for carbon over 0.50 and other alloys.	
Annealing boxes and pots (depending on thickness)	8.35 to 10.40
Add ¼ cent per pound when steam test is specified.	
Annealing bottoms (depending on inside length)	6.80 to 7.60
Charging boxes	7.45
Charging box heads and ends	8.60 to 9.65
(Depending upon weight, quantity and amount of core work).	
Miscellaneous rolling mill and steel works castings	7.70 to 20.00
Add 20 per cent for hollow and disc table rollers and cylinders.	
Add 1 cent per pound for all castings with water circulating pipes.	
Add ¼ cent per pound if over 0.40 carbon is specified.	
Add usual extras for alloys.	
Coupling boxes, spindles, roll housings, pinion housings and anvil blocks	7.35 to 20.05
Gears, gear blanks, gear segments, racks, worms, worm wheels, sprockets, sheaves and pulleys	8.30 to 30.45
Add ½c per pound if over 0.40 carbon is specified or when chemical or physical test is required.	
Railway motor gears and machine molded gears not covered by these prices.	
Add usual extras for alloys.	
Bells, hoppers, hopper extensions, lip rings, tuyere jackets, hot metal or slag pots and rings	8.55
Valve bodies, tuyere stocks, pipes, nozzles and saddles	9.35 to 12.10
Hearth jackets or bosh plates	7.65 to 7.70
Miscellaneous blast furnace castings	7.70 to 20.00
Add 1c per pound for all castings with water circulating pipes.	
Add ½c per pound if over 0.40 carbon is specified.	
Add usual extras for alloys.	
Body and truck bolsters of ordinary design for freight cars, per car set	$87.50 to 176.00
Tender truck bolsters of ordinary design, per 100 pounds	9.50
Truck side frames for freight cars, per car set	118.50 to 218.00
Tender truck side frames (ord. design), per frame	51.00 to 71.00
Couplers:	
	Price per pair
M. C. B. standard type top operating freight car couplers, without uncoupling chains, 5 x 5-inch shanks with 6½-inch butt ends	$38.25
Same, with 5 x 7-inch shanks with 6½-inch butt ends. Increased prices for larger sizes and extra parts, in proportion	39.05
M. C. B. type "D" coupler, regular dimensions, shanks not more than 21¼ inches long, fitted with 9-inch face, knuckles and without chains, 6 x 8-inch shanks with 6½-inch butt ends	51.00
Same, with 5 x 7-inch shanks with 6½-inch butt ends	50.20
Increased prices for larger sizes and extra parts, in proportion.	
	Price for each
Passenger car couplers, old M. C. B. standard type, measuring not more than four feet from pulling face of knuckle when closed to end of shank, 9-inch face knuckles	28.50
Locomotive and special tender couplers, short shank, old M. C. B. standard type, fitted with 11-inch face knuckles and without uncoupling chains	23.80
Same, new M. C. B. standard type "D" short shank, swing head, fitted with 11-inch face knuckles and without uncoupling chains	31.30

All of the above prices apply only to steel castings of the general type, design or specification mentioned. Prices for special designs or specifications will be subject to negotiation.

More Prices Fixed

(*Concluded from page* 1370)

pay a differential of not to exceed $3 over the base price of heavy melting scrap for low phosphorus material not guaranteed as to analysis.

Parties operating mills rerolling old locomotive tires, axles, arch bars, transoms, shafting, or similar rerolling material, shall not pay more than $47.50 per gross ton, (the base price of 4 x 4 rerolling billets), for such material delivered at their works.

No. 1 Railroad Wrought Scrap

The maximum price of $35 per gross ton f. o. b. consumer's works applies to all scrap used by iron rolling mills which normally sold at or under the price of No. 1 railroad wrought scrap, and includes yard scrap, track scrap, short wrought, busheling, wrought iron or soft steel pipe or similar material normally used by bar iron manufacturers.

The term "busheling" scrap used in this ruling means scrap suitable for busheling furnaces.

Cast Iron Borings and Machine Shop Turnings

The maximum price of $20 per gross ton f. o. b. consumers works applies only to turnings and borings used for remanufacture into iron or steel products.

Parties operating chemical plants or plants for purposes other than the remanufacture into iron and steel products may pay a differential of not to exceed $5 above the base price.

Parties employing recognized scrap dealers or brokers to purchase scrap for them may pay such dealer or broker a commission for such service, not to exceed 3½ per cent of the actual delivered price of the materials so purchased.

SPLICE JOINTS

Complete for Light Rails

Section	Price per Joint
8 pounds	.16
10 pounds	.20
12 pounds	.25
14 pounds	.25
16 pounds	.30
20 pounds	.31
25 pounds	.38
30 pounds	.45
35 pounds	.52
30 pound angle bars	.60
35 pound angle bars	.66
40 pound angle bars	.85
45 pound angle bars	1.00

CAST IRON WATER PIPE

Standard cast iron bell and spigot pipe, 6 inches and larger, class B or heavier, is base.

Per net ton of 2000 pounds without penalty.

$49.00 f. o. b. Birmingham, Ala.

55.35 f. o. b. New York City.

54.35 f. o. b. Chicago.

Differentials

3-inch	$10.00 over base
4-inch	3.00 over base
Class A or gas pipe	1.00 additional

FORGING BARS

Finished bars ordered for forging purposes ..... .25c extra

Full bar extras apply in addition to this extra.

NOTE—To be added to standard classification of extras on steel bars at end of subdivision headed "Other Bar Mill Products."

ROLLED TIE PLATES

All sizes and weights, iron or steel, of single shoulder type, for use with standard tee rail sections, per 100 lbs. f. o. b. maker's mill, base $3.25

These prices do not apply to other types of rolled tie plates which will be subject to special negotiation.

STANDARD RAILROAD TRACK SPIKES

Steel Spikes

⅝ x 4½ inches and heavier, 200 kegs of 200 pounds each or more, per 100 pounds f. o. b. cars, Pittsburgh, base $3.90

Less than 200 kegs, $1 per 100 pounds extra.

Extras

Sizes	Per 100 pounds
⅝ x 6½ inches	Base
6 inches	Base
5½ inches	Base
½ x 6 inches	Base
5½ inches	Base
5 inches	Base
4½ inches	Base
½ x 5 inches	$ .15
4½ inches	.15
4 inches	.15
3½ inches	.15
3 inches	.15
7/16 x 4½ inches	.25
4 inches	.25
3½ inches	.25
⅜ x 4½ inches	.40
4 inches	.40
3½ inches	.40
3 inches	.40
2½ inches	.65
⅜ x 3½ inches	.95
3 inches	.95
2½ inches	.95
2 inches	1.30
Reverse point	.25

Iron Spikes

Per 100 pounds, f. o. b. Pittsburgh, base $4.50

Base size and quantity, and quantity differential as given for steel spikes.

Extras for size as for steel spikes to apply.

Improved Operations

Youngstown, O., Dec. 26.—Operating conditions in this district show some improvement over last week. Coal is still short and few mills are running over 60 per cent capacity. The Carnegie Steel Co., owing to coal shortage, has three of its seven blast furnaces operating; the Youngstown Sheet & Tube Co., three of its six; and, the Republic Iron & Steel Co., five of seven. A meeting of representatives of 17 of the largest industrial and railroad consumers in this territory was held last week and the feasibility of the city coal pooling plan was discussed.

The Non-Ferrous Metals

Copper **Lead** **Spelter** **Tin**

New York, Dec. 24.—For the first time in many weeks the spelter market is showing signs of strength. This is due to purchases of Grade C spelter by the government on a scale larger than had been expected, 5000 tons of this grade having been asked for within the past week. The navy department last Saturday closed for 1000 tons of Grade C for delivery over the next six months. This order is understood to have gone to the New Jersey Zinc Co., at a price of 7.87½c, New York. On Friday the war department telegraphed producers to enter their bids on 4000 tons of Grade C for delivery over the next two months. As result of these negotiations, the general spelter market has advanced about ¼c, prime western now being quoted 7.70c to 7.75c, St. Louis, for prompt and December shipment; 7.75c to 7.87½c, for first quarter shipment. Grade C is considered a slightly higher grade of spelter than prime western.

The tin situation has changed but little in months. Shipments are arriving from time to time, but are already sold into consumption long before arrival and the supplies of free tin are as limited as ever. Inquiry continues heavy, but in the absence of offerings trading is light and prices nominal. Spot straits tin is nominally quoted 90c, New York; Banca, 90c; Chinese No. 1, 80c to 82c; Lamb & Flagg, 80c to 82c. There is no sign yet of freer granting of permits by the London rubber and tin exports committee.

The copper situation has been well ironed out and business is being transacted satisfactorily under the fixed price arrangement. Both producers and consumers seem well satisfied and the quotations of 23.50c for carloads and 24.67½c for less than carloads of all grades of copper are being strictly adhered to.

Since the committee of lead producers met with the war industries board at Washington recently to discuss price fixing, following which it was announced that no effort would be made in this direction at present, the outside lead market has shown slightly more strength. Producers are not offering metal freely and the market is largely in the hands of dealers and brokers. The American Smelting & Refining Co. has not changed its quotations of 6.25c, New York, and 6.17½c, St. Louis, but the outside market now is quoted 6.50c, St. Louis, for prompt, December and first quarter shipment.

Following the short-lived flurry in the antimony market a short time ago, during which Chinese and Japanese brands advanced from 13.87½c, duty paid, New York, to 15.25c, quiet has prevailed and prices have gradually settled to about 14.87½c.

Little demand for aluminum is apparent in the outside market. Quotations are unchanged, as follows: No. 1 virgin ingot, 36c to 38c; No. 1 remelted (98 to 99 per cent) 35c to 36c; No. 12 alloy, 27c to 28c; aluminum sheets (contract) 53c to 55c; aluminum sheets (spot) 60c. The producer continues to quote 37c for 1917 and 1918 delivery.

Dullness prevails in the old metals market. Dealers generally have signed pledges promising not to deal in copper scrap at above 23.50c and have done practically no business since this action. Copper scrap quotations are scaled downward from 23.50c. Owing to the scarcity of new tin, block tin has been in good demand and has become extremely scarce. Other descriptions are quiet.

Storing of Coal is Shown Feasible

University of Illinois Tests Reveal Problem One of Preventing Spontaneous Combustion Rather Than Reducing Deterioration—Underwater Storage Stands Up as Best Method, Open-air is Second

WITH the demand for coal at certain seasons becoming more pronounced each year and the transportation facilities of the railroads clearly less equal to the burdens thrown upon them, the storage of coal when possible for use in the future looms up as one obvious solution of the problem. Standing squarely in the path of this way out has been the belief that bituminous coal deteriorated too rapidly to permit of its being stocked in useful quantities for any length of time. But experiments just concluded by the engineering experiment station of the University of Illinois are reported to prove the contrary.

It is the contention of those who conducted the experiments that bituminous coal can be stored without serious loss of such heat units; also, it is claimed that precautions to avoid spontaneous combustion do not entail exorbitant expenditures. Various grades of Illinois-mined coal were used in the tests which covered a period of six years. Portions were stored in exposed bins, in covered bins and under water. As regards heating and spontaneous combustion the factors considered were the oxidation of pyrites, the growth of sulphates, the effects of fineness of division and the effect of moisture. In studying deterioration careful note was made of the indicated heat losses, the escape of combustible gases, the absorption of oxygen, the increase in weight and the decrease of ash percentages.

The conclusions reached were these:

Bituminous coal can be stocked without appreciable loss of heat values provided the temperature is not allowed to rise above 180 degrees Fahr. In fact, there is no appreciable evolution of CO_2 at temperatures below 260 degrees Fahr.

The indicated heat loss per pound of coal is due more largely to an increase in weight of a unit mass of coal resulting from the absorption of oxygen than to an actual deterioration or loss of heat units.

Any method of storage to be successful must either check or prevent the absorption of oxygen to such an extent that the generation of heat shall not proceed so rapidly as to exceed natural heat losses due to radiation.

Underwater storage prevents the loss of heat values and is not accompanied by deterioration in physical properties, such as slacking.

Dry storage is far more safely undertaken if the fine material is screened out at the storage yard and the lump only, preferably sized, is stocked.

Freshly-mined coal has a large capacity for absorbing oxygen which combines chemically with both the organic combustible and the iron pyrites present.

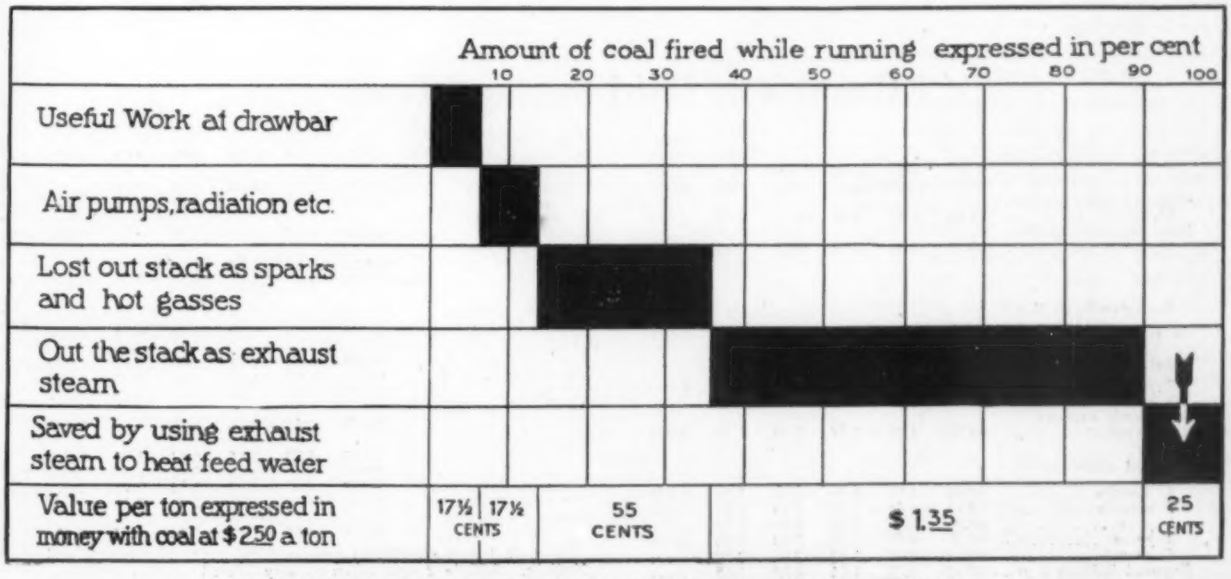
The combination of oxygen with coal at ordinary temperatures generates a small increment of heat.

The rapidity with which oxygen is absorbed depends upon the temperature of the mass and the extent of the superficial area exposed, that is, the fineness of the coal.

If heat is generated by this slow process of oxidation more rapidly than it is lost by radiation the acceleration of the reaction causes a rise in temperature which quickly brings the mass up to the danger point. A temperature of 180 degrees Fahr. is named as the danger point because if the coal reaches that temperature practically all of the free moisture is vaporized and the future rise in temperature will be very rapid.

Those who conducted the experiments report that the main problem in storing coal is more one of preventing spontaneous combustion than of trying to ward off the actual loss of heat values. The avidity of coal for oxygen was found most marked in freshly-mined coal. During the first week after mining, the decrease in heating value was greatest; at the end of five months, through which the decrease was gradual, the losses became more and more slight. The

Abstracted from a booklet describing method of storing coal recently published by the bureau of mines.



WHY WASTE COAL AFTER HAVING TIED UP CAPITAL TO STORE IT?

This diagram shows the small amount of actual work obtained from coal fired in the average locomotive. The waste of coal in generating steam for modern condensing engines in steel-works power plants, while not quite so high, is worth considering.

activity of the pyrites was found to wait somewhat upon the rise in temperature from organic oxidations before the reaction with sulphur reached a serious stage. It was also established that the oxidation of sulphur increases in activity as the size of the particles decrease.

On an average it was found that the indicated loss of heat values after a period of one year runs from 3 to 3½ per cent. The losses are ascribed to three distinct causes: The escape of combustible gases, the absorption of oxygen and the increase in weight of the organic or combustible portion of the coal. Deterioration seems consistently greater in the case of screenings than in lump coal, the investigators learned. Underwater storage showed the best all-around result, with storage in the open second and in covered bins third.

The accompanying table, setting forth the analytical results for the entire period or one grade of coal, is typical.

Table I

Comparative Deterioration Screenings

Sample taken after mining	Dry coal — Ash	Dry coal — Sulphur	Dry coal — B.t.u.	B.t.u. referred to actual or unit coal	Decrease — B.t.u.	Decrease — Per cent
STORED IN EXPOSED BINS						
Same day	17.13	4.92	11,752	14,604	...	....
7 days	17.04	4.47	11,684	14,481	123	0.84
2 months	17.22	5.00	11,645	14,488	116	0.79
6 months	17.02	4.54	11,526	14,281	323	2.21
1 year	17.25	4.54	11,153	13,853	751	5.14
3 years	15.94	4.03	11,131	13,565	1039	7.11
6 years	14.95	3.32	11,326	13,604	1000	6.85
STORED IN COVERED BINS						
Same day	17.13	4.92	11,752	14,604	...	....
7 days	17.04	4.47	11,684	14,481	123	0.84
2 months	18.33	4.70	11,414	14,404	200	1.37
6 months	17.30	4.67	11,466	14,263	341	2.33
1 year	17.06	4.73	11,248	13,944	660	4.52
3 years	18.71	4.86	10,325	13,072	1532	10.48
6 years	17.39	3.81	10,497	13,025	1579	10.81
STORED UNDER WATER						
Same day	17.13	4.92	11,752	14,604	...	....
Same day as submerged	17.04	4.47	11,684	14,481	123	0.84
6 months	19.86	5.60	11,127	14,372	232	1.59
1 year	18.27	4.81	11,479	14,478	126	0.86

Bureau Tests Similar

Experiments conducted by the federal bureau of mines over a period of five years with various kinds of bituminous coals stored under water and in open and exposed bins showed generally similar results. The deterioration in heating value was found to be much less than that generally believed. Underwater storage was found not worth the extra cost, except as a means of guarding against spontaneous combustion.

Semibituminous coal mined near New River, W. Va., a variety largely used by the navy, was placed under observation at Pittsburgh, Key West, Fla., Norfolk, Va., and Portsmouth, N. H. Pocahontas coal, also semibituminous, was tested under tropical conditions at Panama. Pittsburgh gas coal was exposed at Ann Arbor, Mich. A semibituminous coal mined near Sheridan, Wyo., was stored at Sheridan and tested at Pittsburgh.

Summarizing the data procured the bureau says: "The results of all these tests are to be taken as showing only the change in heating value and approximately, also, the degradation of the lumps by weathering. As to any resultant deadening effect or decrease of original ease of burning no examination was made. In brief, the tests showed that the amount of deterioration of coal in heating value during storage has commonly been overestimated. Except for the subbituminous Wyoming coal no loss was observed in outdoor weathering greater than 1.2 per cent in the first year or 2.1 per cent in two years. The Wyoming coal suffered somewhat more loss, 2 to 3 per cent in the first year and as much as 5.5 per cent in three years. With New River coal the expense of underwater storage equipment is not justified except as an absolute preventative of fires from spontaneous combustion."

"Unit Coal" Basis of Values

In comparing values the investigation went only so far as to show the extent of deterioration in the actual coal substance or "unit coal". It is explained: "In studying the deterioration of coal the important practical problem is to determine the change in the dry organic substance. The

Table II

Results of Cold Storage Tests

	Carbon	Hydrogen	Nitrogen	Oxygen	Total sulphur	Sulphate sulphur
Mine sample 1, Aug. 27, 1909	89.86	4.87	1.51	3.76	0.83	0.005
Mine sample 2, Dec. 14, 1909	89.70	4.89	1.66	3.75	2.18	.....
Portsmouth, N. H.:						
As stored under water	89.52	4.89	1.52	4.07	1.06	0.006
Submerged—						
2 years	89.71	4.68	1.74	3.87	1.04	0.030
5 years	89.00	4.84	1.72	4.44	1.36	.....
As stored, exposed outdoors	89.82	4.86	1.57	3.75	1.24	0.004
Exposed outdoors—						
3 months	89.86	4.70	1.54	3.90	1.38	0.020
6 months	90.11	4.91	1.63	3.35	1.29	0.038
1 year	89.91	4.62	1.58	3.89	1.18	.....
2 years	89.56	4.77	1.75	3.92	0.98	0.105
5 years	89.52	4.85	1.67	3.96	0.78	.....
Exposed indoors 5 yrs.	89.42	4.78	1.71	4.09	1.05	.....
Key West, Fla.:						
As stored under water	89.80	4.79	1.75	3.66	2.63	0.011
Submerged—						
8 months	89.73	4.76	1.68	3.83	2.01	.....
2 years	90.39	4.83	1.59	3.19	2.96	.....
As stored, exposed outdoors	90.61	4.87	1.67	2.85	0.79	0.007
Exposed outdoors—						
8 months	89.68	4.70	1.62	4.00	1.29	.....
2 years	88.13	4.87	1.83	5.17	2.07	0.25
Pittsburgh:						
As stored under water	89.99	5.00	1.59	3.42	0.71	0.006
Submerged—						
3 months	90.18	4.79	1.64	3.39	0.73	0.000
6 months	90.26	4.85	1.63	3.26	0.77	0.005
1 year	90.15	4.68	1.68	3.49	0.75	.....
As stored, exposed indoors	89.59	4.86	1.55	4.00	1.25	0.005
Exposed indoors—						
3 months	89.93	4.79	1.66	3.62	1.23	0.020
6 months	89.36	5.17	1.65	3.82	1.38	0.022
1 year	90.08	4.67	1.63	3.62	1.26	.....
2 years	90.31	4.74	1.70	3.25	1.10	0.043
Exposed outdoors, 5 years	90.23	4.75	1.74	3.28	0.76	0.08

(Sample 1 was distributed among Pittsburgh, Portsmouth and Norfolk. Sample 2 was taken to Key West.)

Table III

Summary of Tests of New River Coal

Condition of test	—Percentage loss in heat value during— 3 mos.	6 mos.	9 mos.	1 yr.	1½ yrs.	2 yrs.	3 yrs.	4 yrs.	5 yrs.
SUBMERGED:									
Portsmouth, N. H.	0.2	0.5	0.1	0.0	0.5	0.3	1.1	0.5	0.4
Norfolk, Va.	0.3	0.2	0.1	0.2	0.2	0.5	0.9	0.4	0.5
Key West, Fla....	0.2	0.3	0.1	0.2	0.2	0.0	0.9	0.4	...
Pittsburgh									
Run-of-mine coal.	0.1	0.0	0.0	0.0	0.1	0.0	0.6	0.2	0.1
¼-in. crushed coal	0.0	0.1	0.0	0.1	0.1	0.0	0.7	0.1	0.1
Average	0.16	0.55	0.06	0.10	0.55	0.16	0.84	0.32	0.28
EXPOSED INDOORS:									
Run-of-mine coal—									
Portsmouth, N. H..	0.0	...	...	0.1	0.5	0.3	0.9	0.8	1.0
Norfolk, Va.	0.0	0.1	0.1	0.2	0.2	0.2	0.5	0.7	0.8
Key West, Fla....	0.1	0.3	0.1	0.4	...	...	...	...	...
Pittsburgh	0.1	0.4	0.0	0.1	0.4	0.2	1.1	0.9	0.6
¼-in. crushed coal—									
Portsmouth, N. H..	0.6	...	...	0.4	0.7	0.9	1.3	1.6	1.4
Norfolk, Va.	0.1	0.4	0.3	0.2	0.5	0.4	1.0	1.2	1.2
Key West, Fla.....	0.0	1.0	0.8	1.2	...	...	...	...	...
Pittsburgh	0.3	0.5	0.4	0.6	0.9	0.6	1.6	1.6	1.7
WEATHERED:									
Run-of-mine coal—									
Portsmouth, N. H..	0.2	0.4	0.4	0.2	0.4	0.7	1.1	1.0	1.4
Norfolk, Va.	0.0	0.1	0.0	0.3	0.2	0.6	1.0	1.3	1.1
Key West, Fla.....	0.5	0.5	0.6	0.4	0.8	1.2	2.6	...	...
Pittsburgh	0.1	0.6	0.0	0.4	0.5	0.7	1.3	1.0	1.2
¼-in. crushed coal—									
Portsmouth, N. H..	0.3	0.3	0.3	0.5	0.7	0.9	1.3	1.2	1.3
Norfolk, Va.	0.1	0.2	0.3	0.7	0.7	1.2	1.5	1.8	1.3
Key West, Fla....	0.3	0.4	0.6	0.7	1.8	2.1	2.5	...	...
Pittsburgh	0.3	0.7	0.6	0.6	0.8	1.1	1.6	1.6	1.3

incidental ingredients—sulphur, ash and moisture—that accompany the coal substances affect the calorific value of a coal, but any changes that they may undergo have nothing to do with the alteration of the coal substance itself.

At Pittsburgh eight barrels were placed in storage Sept. 30, 1909. One barrel each of ¼-inch coal and run-of-mine coal was filled with fresh water so as to submerge the coal. One barrel of each grade was placed indoors loosely covered. Two barrels of each were emptied in separate piles on the roof of the experiment station. At Portsmouth, N. H., nine boxes were placed in a larger box, which was sunk in salt water. One barrel of each, with head removed, was placed on a platform and one barrel of each grade emptied on the roof of a shed. At Norfolk and Key West the test conditions were much the same. One noticeable conclusion is that salt water has no superior qualities over fresh for coal storage. During the first two years of the experiments every sample was analyzed by the same man, with the same calorimeter, at Pittsburgh.

In the case of the Pittsburgh gas coal observed at Ann Arbor, Mich., the amount of deterioration in one year's open-air storage was negligible. During the succeeding four years the deterioration proceeded very slowly and did not reach an amount greater than 1.1 per cent. The showing of Pocahontas coal at Panama was parallel. Wyoming coal showed up the poorest of all, the physical appearance as well as chemical properties receding much more markedly. It was also learned that storing of Sheridan coal in piles greater than 10 feet in depth or width is dangerous because of its heating properties.

The Electrolytic Pickling of Steel

BY M. DE KAY THOMPSON AND O. L. MAHLMAN

ALL iron or steel which in the process of manufacture has been heated in the air is covered with "fire scale", which is an oxide of iron having an approximate composition formula of Fe_3O_4. This has to be removed before the surface can be plated or galvanized, usually by immersing in some acid until the scale is removed by the hydrogen formed by the action of the acid on the iron beneath the scale, which it reaches through the cracks in the scale.

The action which would be expected if a sheet of iron covered with scale were used as cathode in an acid solution is a reduction of the higher oxide to lower oxide. This oxide would be dissolved by the acid. There would also probably be a certain amount of chemical action between the iron under the scale and the acid, as in the purely chemical treatment. It is this action which the electrochemical process attempts to eliminate as much as possible. The electrolytic method has been patented by C. J. Reed. His specifications, which are followed in this investigation, are: Sulphuric acid of 1.2 specific gravity, at 60 degrees Cent., current density of 40 to 60 amperes per square foot. The anode is lead. The iron sulphate formed is to be removed from the solution from time to time by cooling to 0 degrees Cent.

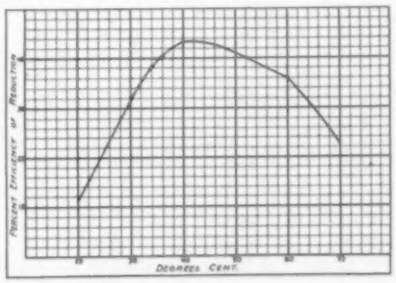


FIG. 2—RELATION BETWEEN CURRENT DENSITY AND EFFICIENCY OF REDUCTION OF Fe_3O_4

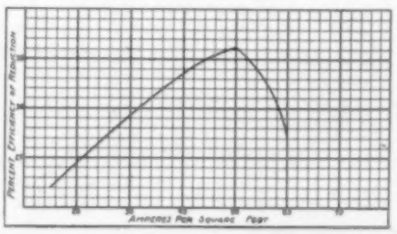


FIG. 1 — RELATION BETWEEN TEMPERATURE AND EFFICIENCY OF REDUCTION OF Fe_3O_4

The method of comparing the two operations consisted in treating two similar mild-steel plates covered with equal amounts of scale by the two methods until their appearance showed the pickling was completed. The pickling baths were then concentrated until all solid matter which had dropped off was dissolved, and were then analyzed for iron.

A comparison that would probably represent more nearly the conditions of practice would be to filter off the solid matter and determine the iron in solution right after the pickling. The method given above was adopted because it was thought the results would be more consistent.

The scale was produced by heating for 2 to 8 minutes pairs of plates

This paper was presented at the recent Detroit meeting of the American Electrochemical Society.

in a muffle furnace, after which they were cooled in air. One of these was then treated by the chemical methods, the other by the electrolytic.

The chemical treatment consisted of immersing in a boiling sulphuric acid solution containing about 5 per cent acid until the surface was cleaned of scale. The cell for electrolytic pickling was placed in a thermostat and the iron plate was suspended between two lead anodes. Weighed portions of the concentrated solutions were taken for analysis. The iron was determined by passing the solution through a Jones reductor and titrating with potassium permanganate. The data, taken on the three runs which were made, are included in the accompanying table.

The run for which data are given in Table III is seen to vary considerably from the other two runs, probably due to accidental differences in the quality of the scale. A larger number of runs would be desirable in order to get a better average value in the saving which could be effected by the electrolytic method.

In order to see to what extent the oxide Fe_3O_4 is reduced by the current when acting as cathode, some fused magnetite electrodes 3.80 centimeters in diameter were used as cathodes in a solution of sulphuric acid of 1.2 specific gravity enclosed in a porous cup, having a gas-tight cover through which the hydrogen liberated passed to a collecting bottle. It was then transferred to a Hempel burette for measuring. A gas coulometer was connected in series with this cell and the gas was collected in a eudiometer tube. The collection from the two cells was made for equal simultaneous intervals. By comparing the amount of hydrogen liberated in the coulometer (2/3 of the total gas) with that liberated from the cathode compartment, the per cent of hydrogen used to reduce the oxide can be computed. The results are given in Table V and are shown in Figs. 1 and 2. The curves show that the reduction is most efficient at about 50 degrees Cent., and with a current density of 50 amperes per square foot.

From this it is evident that under these assumptions the saving in iron and acid is far greater than the cost of the power. Part of the iron included in this calculation is the scale itself, as explained above. These experiments should be repeated, determining only the iron in solution and not including the scale which is removed as such during the pickling. The values of practice would then lie between these two values.

The relative efficiency of electrochemical and chemical pickling was determined. The saving in expense which would be effected under the conditions of these experiments, showing greatly in favor of the electrochemical method. The extent to which fused magnetite is reduced in sulphuric acid solution under different conditions of temperature and current density was also measured, and the best conditions of temperature and current density were determined.

Book Review

Good Health; by Alvah H. Doty, M. D.; cloth; 304 pages, 5 x 7 inches; published by D. Appleton & Co., and furnished by THE IRON TRADE REVIEW for $3.00.

Good health is essential to good work. Dr. Thomas Darlington, medical director of the American Iron and Steel institute, therefore recommends "Good Health" to the iron and steel industry as worthy of consideration. The structure of the body and the vital processes are described in chapters I and II, and succeeding chapters discuss proper food, ventilation, and other matters upon which the body depends for its well being.

Comparison of Electrolytic and Chemical Pickling

Table I

	Electrolytic	Chemical
Area of plate (sq. cm.)	152.0	152.0
Strength of acid	1.2 sp. gr.	4.0%
Duration of pickling (minutes)	19.0	23.0
Temperature, degrees Cent.	62.0	100.0
Current (amperes)	8.5	.....
Volts	2.5	.....
Total weight pickle liquor (grams)	647.3	708.6
Weight analyzed (grams)	32.56	42.61
0.2n$KMnO_4$ used (c.c.)	14.28	23.10

Table II

	Electrolytic	Chemical
Area of plates (sq. cm.)	823.0	830.0
Strength of acid	1.2 sp. gr.	4.0%
Duration of pickling (minutes)	32.0	41.0
Temperature, degrees Cent.	60.0	100.0
Current (amperes)	9.5	....
Volts	2.7	....
Total weight pickle liquor (grams)	919.0	470.3
Weight analyzed (grams)	56.05	35.20
0.2n$KMnO_4$ used (c.c.)	30.47	63.85

Table III

	Electrolytic	Chemical
Area of plates (sq. cm.)	832.0	835.0
Strength of acid	1.2 sp. gr.	5.0%
Duration of pickling (minutes)	3.75	43.5
Temperature, degrees Cent.	60.0	100.0
Current (amperes)	9.4	.....
Volts	2.6	.....
Total weight pickle liquor (grams)	755.0	507.7
Weight analyzed (grams)	30.81	30.13
0.2n$KMnO_4$ used (c.c.)	8.39	17.65

The appearance of the surfaces of the plates from the two processes was the same. The results are given in Table IV for comparison.

Table IV

Run Number	1	2	3
(a) g. iron per sq. cm. in electrolytic pickle	0.0166	0.00678	0.00275
(b) g. iron per sq. cm. in chemical pickle	0.0282	0.0115	0.00395
Ratio of (a) to (b)	0.590	0.590	0.696
Watt hr. used per sq. dm. pickled	4.42	1.65	0.184
Watt hr. per g. iron in electrolytic pickle	2.67	2.43	0.667
Cost of power for removing 2000 lbs. of iron (as scale and iron)	$7.44	$6.76	$1.86
Value of acid saved for every 2000 lbs. of iron removed	25.00	25.00	15.70
Value of saving in iron for every 2000 lbs. of iron	55.60	55.60	34.80

(Power was figured at $20 per horse power year, acid at 80 cents per 100 lbs. 60 degrees acid, iron at 4 cents per pound.)

Table V

Current density amperes per sq. ft.	Temperature degrees Cent.	Coulometer Vol. cc.	Vol. H_2 cc.	Eff. per cent
60	60	142.7	68.4	28.0
60	60	144.4	70.0	27.4
60	60.5	144.5	71.0	26.3
50	60	146.2	62.4	36.0
50	60	146.2	62.4	36.0
50	60	144.0	61.0	36.5
40	60	139.7	61.8	33.5
40	60	140.0	62.0	33.5
30	60	145.4	66.8	31.1
30	60	145.4	68.0	29.9
30	60	145.8	71.0	27.0
15	60	102.7	53.2	22.2
15	60	102.3	53.1	22.1
50	20	121.0	71.8	10.9
50	20	120.2	71.4	11.0
50	30	102.1	46.0	32.4
50	30	101.7	46.4	31.6
50	30	101.0	47.0	30.2
50	40	102.4	34.0	50.2
50	40	101.8	38.8	42.8
50	40	103.0	43.0	37.4
50	50	123.8	48.8	40.9
50	50	123.8	48.8	40.9
50	60	146.2	62.4	36.0
50	60	146.2	62.4	36.0
50	60	144.0	61.0	35.5
50	70	102.8	53.4	22.0
50	70	102.5	53.8	21.2
50	70	103.3	52.2	24.2

Gas Explosions at Blast Furnaces

Methods of Handling Gas That Promise the Greatest Security Against Disastrous Explosions—Saturating an Explosive Mixture With Steam Renders It Inert —Precautions When Blowing-out and Blowing-in

BY F. H. WILLCOX

A REVIEW of blast-furnace accidents during the past few years shows that the number of explosions is considerable. Few furnace men like to talk about them and there is virtually no mention or discussion of them in trade journals, possibly because there seems to be a feeling that such an accident reflects on the care and judgment of the men in charge. This view is warranted in some instances, but is wide of the mark in others. The uncertainty and unsatisfactoriness of attempts to state that a certain number of gas explosions are caused by unskillful handling of the gas lies in the fact that practically every furnace man has a particular way of handling the gas, each method differing radically or in some small detail from the others. These methods rest on personal experience and training and the exigencies of plant layout, or have been handed down from man to man; some of these methods provide sufficient safety in most cases, but have failed to provide for it when some abnormal factor was introduced.

That it is not always easy to burn blast-furnace gas instantly—that is, explosively—is demonstrated daily at blast-furnace stoves. The gas does not burn instantly but rather intermittently. As the air and gas mingle at the nose of the gas burner complete combustion does not take place immediately, even with approximately thorough mixing, as is shown by the length of the flame, the constant effort being to get a short flame.

But as a rule, if the gas ignites promptly at the burner, there is no explosive tendency. The nearest approach to explosive combustion after the gas is lighted is seen when an excess of gas is turned in the stove, and for some reason—for instance, to see how the gas is burning—the stove tender opens an air or cleaning door. Under these circumstances the burning gas sometimes puffs from the door of the well, a hazard of stove tending that at times results in painful if not serious burns.

A similar condition is encountered when the stove checkers are more or less plugged up, or the stack draft is insufficient, and at times when cold washed gas is burning in a cold well. In the latter case, the presence of excess air causes the flame to be extinguished at the base of the stove well, a mixture of air and gas fills the well, ignites at the checkers, and travels down in the well with almost explosive violence, and bursts out of the air-inlet doors. At such times it is not safe to go within 8 or 10 feet of the doors. The only practical precaution against these conditions is to so adjust the gas and air on turning the gas on that as long a flame as possible is produced, and then slightly to reduce the length of the flame by admitting a slight excess of air. This is, of course, the method of experienced stove tenders, and the close regulation of the air is often a source of surprise to those undertaking to increase the efficiency of stoves by analyses of the stack gases. Shortening the flame may also be produced by a deficiency of air, but this error will, of course, result in the liability of an outrush of flame from the well.

More nearly allied to true explosions is the hazard of permitting gas and air to pass into a stove, when it is put on gas, without its lighting immediately. When a stove well is hot, the gas should ignite almost instantly, and it usually does, with perhaps a slight puff. In the case of a cold stove, the danger lies in a stove tender allowing the stove to fill with gas and air before lighting the gas at the burner. Such practice is especially dangerous when gas from a furnace that has been shut down from a leaking tuyere or other leaky bronze is turned into a stove, or when gas from a newly blown-in furnace is being turned into the stoves. Several years ago a stove was entirely destroyed by an explosion caused by lighting the gas after the stove was full, and the stove tender was killed. There have been several injuries from this cause, and the precaution of having a good fire in the well or at the burner door is especially called for in turning "wild" gas into stoves. In fact, the elementary and only practical precaution to obviate all such explosions lies in providing a fire of burning waste, wood, coke, or coal at the gas-door inlet of cold stoves before the gas is turned on.

In the event of gas being turned into a run-down stove and failing to ignite immediately the gas should be turned off instantly and a pilot fire provided. In turning the gas on, the stove tender should step away quickly from the burner after racking it into the burner door frame. Many burners are so badly designed that the stove tender in racking the burner into the door is compelled to stand within 2 to 4 feet of the opening, and must spring away as he racks the burner in; also if the gas does not ignite promptly, he is in some danger should it ignite while he is racking the burner back. Burners should be so designed—as several types are—that the stove tender can stand 6 to 10 feet from the burner door when turning the gas on. Stove cleaners should be warned of the danger of flame flaring out and burning them if the stove door of a well is opened with the gas turned on full. The gas should be turned off in part before a well-cleaning door is opened.

The fact that explosions occur at the furnace top and in the down-comer at such times, when the temperature in the top immediately before stopping the furnace is only 350 to 550 degrees Fahr., may be explained by the assumption that the brickwork even at these temperatures may start combustion, and also from the fact that carbon, carried

A Duty of a Superintendent

ATTEMPTS to differentiate explosions in blast furnace practice due to defective methods of handling gas from those that are largely fortuitous are useless. It can be said that the number due to carelessness of the men in charge is extremely small, for probably nothing in the routine of furnace operation puts a man under a greater strain than his dread of a gas explosion when confronted with an unforseen stop or the necessity of blowing-in or blowing-out. No matter how reliable the foreman or assistant may be, the superintendent is always present, if possible, when such jobs must be done, and the responsibility he must bear is always sufficient to insure his taking the greatest care.

This article is an extract from a bulletin entitled, "Blast-Furnace Breakouts, Explosions and Slips," by F. H. Willcox, bureau of mines, Washington, D. C.

out of the stock by the gases, may have deposited in places on the walls. This carbon dust is highly pyrophoric, and in contact with air emits sparks or burns easily and may therefore ignite a mixture of air and gas at exceedingly low temperatures and thus initiate on explosion on top. The essential factor in preventing such top explosion obviously lies in not permitting any mixture of air and gas to draft up into the top of the furnace until sufficient time has been allowed for the top to cool. In view of the fact that there are innumerable small leaks along a gas main at burner doors, explosion doors, or at bleeders on dust catchers or ends of mains, and that gas in cooling from 450 to 200 degrees Fahr., contracts in volume approximately 30 per cent, and that with a bleeder or bells open on top the gas in the mains tends to drift up the furnace, there is every probability that, in case of shutdown, in the course of a few hours the mains will draw in a considerable amount of air and at a certain distance from the end be filled with air and gas in proportions closely approaching an explosive mixture. For this reason it is considered safest to draft out the mains rather than allow them to remain in such condition indefinitely, or even longer than is necessary for the top and downcomer lining to cool off.

The Use of Steam

Inasmuch as possibilities of danger are presented with every variation and modification of method and use of apparatus in brief shutdowns, it is interesting to note one practice which is safe and in which few, if any, combinations of circumstances can introduce any possibility of danger. If steam is turned into the gas main at every shutdown of a longer duration than or differing in kind from a castings period, there can be no explosions of gas. The steam may be connected with the system at the dust catcher or at a point next to the water seal, goggle, or sand valve which separates the dry-cleaning apparatus from the rest of the gas-main system. The best way to make the connection is to have the steam inlet valve on the foundation level within reach or to have a hook hanging from the valve and within reach.

The use of steam prevents a vacuum in the gas system when drafting back through the stoves with the bells, bleeder, and burners closed, or when drafting through the top of the furnace with the burners open, because a blanket of steam is interposed between the gas and air; also any explosive mixture formed in drafting up the downcomer is saturated with steam and rendered inert. The use of steam may easily be made a regular part of the plant practice. The small cost and the brief time required for turning the steam in at shutdown are amply repaid by the assurance that there is no possibility of even small "cracks" at the burners or top, to say nothing of more serious explosions.

The use of steam in handling furnace gas was introduced and first given publicity in 1905 by J. W. Dougherty, who applied for and received a patent on its use. Some furnace men dispute his priority in this application of steam, but the writer has been unable to find any record of another claiming to have used it before this date. It is, however, claimed to have been used in gas flues of steel-works furnaces prior to 1905.

The problem at isolated furnaces of bringing the gas down causes much anxiety, owing to the dread of an explosion. Some furnacemen believe that furnace gas and air will ignite or explode spontaneously at such times, that is, explode in the direct absence of fire or other igniting medium.

As a rule, the men who believe such explosions result spontaneously belong to the older school of furnacemen, with a few converts to the theory among the younger group, conversion having been effected by experience or direct testimony. One furnaceman who had an unexplainable gas explosion of this type years ago now follows the practice of blowing a considerable volume of cold air through the furnace after it is filled and before it is lighted in order to blow out any loose dust and fine ore which otherwise would presumably be blown out when the furnace is lighted and the blast put on. He attributes this type of explosion to the presence of these fine dusts. This is cited as an illustration of the real belief in these explosions being caused by spontaneous combustion.

Sources of Danger

The chief danger in bowing in furnaces is the danger of gas explosions. Other possible sources of danger and damage exist, but the most important points to be watched are as follows:

1.—Drying the furnace is preferably done by hot blast when gas from another furnace is available. This enables the furnaceman to assure himself that stoves, valves, stocks, and other equipment are in working condition and eliminates some chances for accident due to the unforeseen necessity of taking the blast off and allows him to devote his attention to the working of the furnace.

2.—In case the hearth bottom, or the top of the salamander, is excessively hot it is advisable to place a 12-inch brick pier with asbestos padding on top beneath the scaffold uprights and to place about 20 inches of crushed slag on the hearth bottom before putting wood or coke in the hearth. It is also a good plan to turn the water into the tuyeres coolers, etc., before the furnace is filled to see that all connections are water-tight and not stopped; the bronze should be inspected for leaks from the inside.

3.—In placing wood or charcoal in the hearth and bosh, the use of electric lights should be compulsory, accident being invited by the use of candles, torches, or open lights, or by allowing men to smoke. All men not required for the work should be kept away, such as visitors and spectators.

4.—Before lighting the furnace the foreman in charge should, by personal inspection, assure himself that all gas burners are sealed; burner doors closed; openings on mains, dust catchers, and down-comers tightly closed; the bells, bleeders, and explosion doors on top fastened open; and the water seal or other valves in good condition, special attention being given to see that all mechanical valves are tight and the water connections open, and that the burners are tight; if necessary, some clay or dust should be put on the burner slides to act as a seal.

5.—If the blast is put on immediately when the furnace is lit, the chances of men being burned by coke or flame shooting from the tuyeres when the scaffold falls or from a "crack" of gas at the top are eliminated. If the furnace should be lit and allowed to burn on natural draft for a period of 6 to 36 hours, the following precautions are suggested:

(*a*) If the blowpipes are up and the caps off or the eyesights open, the foreman should be sure that the hot-blast valves are securely seated so that no draft will be induced into the blast main.

(*b*) If the blowpipes are not up, but the tuyeres are placed, the tuyeres should be blocked in place with a 2 x 4-inch timber against the stock, the latter being held by the bridle.

(*c*) The foreman should keep everyone away from the tuyeres and stocks until he is satisfied that the scaffold has fallen, and should not start to put up blowpipes until this has happened. In drafting in, the scaffold will usually fall in three to five hours if care is taken that the furnace is nicely lit all the way around and it burns evenly at all the tuyeres.

Safe Practice with Single Furnace

The method of handling gas depends upon whether furnaces at the plant are in blast and are making gas, but if it be assumed that no other furnace is in blast the following notes are typical of safe practice:

1.—The gas pressure should be kept

up at all cost after the gas has been brought down into the mains, 3 inches of water pressure being regarded as the minimum. Accidental lowering of the bell or bells so as to leave the top open after the gas is brought down should be guarded against. This is a simple precaution and one that should not be overlooked.

2.—The foreman should be sure the gas is all right, clear of wood smoke and gas, before bringing it down. The first hour after lighting produces the most explosive gas, so time should be allowed for the ore to get into action before the gas is used. The time of taking the gas down varies, ranging from immediately to 36 hours after the blast is on. A safe rule to follow is to wait eight hours after the scaffold has fallen, and then, after the furnace is filled and the coke is bright at the tuyeres and the blast pressure amounts to 4 pounds, proceed to bring the gas down. This period of time will assure the smooth working of the bell and there will be less chance of some unforeseen difficulty preventing the bells from closing or opening. There is certain to be ample gas pressure in the mains, and the gas, though explosive when mixed with air, is not markedly more so than later.

3.—The essential idea is to clear all mains, dust-catcher systems, etc., of air, being positive that none is trapped in any space or dead end before the gas is lighted, the aim being to constantly keep a positive outward pressure. To this end it is requisite that the blast shall not be taken off the furnace during the first few hours after turning the gas into the mains or, of the blast is considerably slackened, that enough burners be closed to maintain 3 inches of water pressure in the gas mains.

4.—After personal inspection to see that all burners and burner doors are shut, the valve, if any, between the stoves and dust catchers is opened, and the bells closed if still open, at as nearly the same time as possible. The bell will usually have been shut previously, however. Before the gas is brought over into the main, the air should be expelled from the dust catcher through the dust bell and bleeder, if a bleeder is provided on the dust catcher. After making sure there is no fire near the gas mains and that the burner doors are shut, then the bleeder at the extreme end of the gas main, or the cleaning door at the base of the downleg to the stove or boiler farthest from the furnace should be opened. When sufficient time has elapsed to make sure that all the air has escaped from the mains the cleaning door may be shut, the burner door opened, and the gas lighted in the stove. Unless the stove is incandescent at the bottom, a large bunch of oily waste or a wood fire at the gas inlet should be used to insure instantaneous lighting. It is dangerous to permit gas of this nature to pass into a stove without lighting it immediately, as, if the well fills with an explosive mixture of gas and air, an explosion or a "crack" of sufficient violence to throw many types of burners off their seats may result. Such damage is especially serious and fraught with danger at this stage of blowing in, because a shutdown may be necessitated, and more serious explosions are possible.

5.—Similar methods are followed at the boilers, the exception being that instead of allowing the gas to escape into the boiler house when no bleeder is provided at the end of the line it is prefereable to have the boiler at the end of the line cold, and draft the boiler house main through this boiler until the gas is coming strong when it may be lighted at an adjacent boiler.

6.—In lighting stoves and boilers, the danger, after successful lighting of the first one, lies in putting too many on. It is better to have too few lighted than too many; the gas pressure should be maintained at least 3 inches. In lighting gas from a furnace newly blown in, additional supervision, both at boilers and stoves, is advisable, and this step should never be undertaken without the supervision of the furnace foreman or blower.

7.—In case a shutdown becomes necessary on an isolated furnace, it is better not to draft back. Shut all the burners and keep the bells and bleeders closed before taking the blast off. This insures a positive pressure under the bell and avoids an updraft through the bleeder, and if the pressure is too strong at the tuyeres a few caps can be knocked off to afford relief. When a furnace is started up after a stop of this nature it is best, in lighting the gas, to observe all precautions taken in first bringing the gas down.

8.—If a steam line is connected to the dust-catcher system, the system should be filled with steam prior to shutting down, and the steam kept on until the blast is put on again. Steam is a valuable auxiliary in blowing in, and if a connection is provided steam should be turned into the dust catchers shortly before the furnace is lit, and kept on until the gas has been brought down and is passing out of the mains through the bleeder.

Using Gas From Other Furnaces

If one or more furnaces are in blast, connecting them with the gas mains of the furnace being blown in simplifies taking the gas down, as one is always assured of ample gas pressure in the mains.

1.—If gas from another furnace is available, the gas is usually being burned in the stoves of the new furnace at the time it is being blown in. If not it is a simple matter to bring the gas up to the valve separating the dust catcher from the main of the new furnace, clearing the downlegs of the stove burners of this furnace. At the determined time, which may be earlier than with an isolated furnace but not before the scaffold has fallen, with bright coke showing at the tuyeres and the snort valves shut, the stoves along the line should be closed temporarily to be sure that the gas pressure in the mains is greater than that at the top of the furnace being blown in, the dust-catcher valve opened, and, the furnace bleeder and bells being open, the gas from the other furnace is permitted to pass through the dust catcher and up the downtake, driving the air out through the furnace top.

2.—When the air is displaced, the bells and bleeders may be shut and the stove and boilers put on, care being taken to clear all dead ends in the gas mains, and observe the usual precautions with regard to lighting gas.

3.—If there is a steam connection to the dust-catcher system, it may be turned on prior to admitting gas from the other furnace; indeed, it is the safest practice to keep steam in the dust catcher from the time the furnace is lit until gas has been brought over from the adjoining furnace.

4.—The old practice of keeping a coke fire burning on top has much to recommend it and may be adapted to modern closed-top furnaces by putting a large bunch of burning waste on the skip, hoisting and dumping it into the hopper, the bells being open. Upon the gas lighting, the bells may be closed and gas led off from the bleeder. This takes more time and trouble than many consider necessary, but it is a practice which is followed by several men and warmly believed in.

5.—In case of an accidental shutdown, gas may be brought over from the other operation to the furnace being blown in, and the air having been displaced the bells and bleeders can be closed prior to shutting down or taking the blast off. This insures a positive pressure at the furnace top under the bell and in the gas-main system.

No attempt is made to specify procedure or rules, as innumerable points must of necessity be taken care of as they arise and according to the plant layout and furnace design. The essential features of blowing out a furnace are summarized as follows:

1.—Before starting to blow down put a water spray on the large bell and three spray pipes through the try holes. The holes in these pipes should be below the lip of the large bell, and be so

drilled that the water is sprayed toward the center of the furnace. The spray cools the gas and prevents it from heating the top excessively, warping the bells and hopper, or damaging the offtakes and downcomers; the steam generated also tends to prevent gas explosions.

2.—Examine the receiving hopper and the large bell hopper to make sure that not enough material has collected to wash down and seal the opening between the large bell and its hopper. It is inadvisable to seal the bell and hopper with flue dust, ore, or sand when water is used on the bell, as the water may accumulate in quantity on the bell and be dropped into the furnace. It is better to provide an opening between the bell and hopper by hanging rods, cables, or chains from the gas-seal doors between the large bell and hopper extension, and then to close the bell against them. This prevents the accumulation of water, provided the bells and hoppers are cleaned before starting to blow down.

3.—The bell should be locked, blocked, or clamped in position after these distance pieces are placed, in order to prevent its being opened by mistake. Also block or fasten shut the dust-catcher bells, bleeders, etc., to prevent any possibility of gas drafting up through the downcomer in case the blast is taken off unexpectedly.

4.—Provide a water-pressure gage on the supply line to the top sprays, at the cast-house floor level, so that an idea may be had of the adequacy of the pressure and supply of water. It is also a good idea to provide a water-escape valve on a tee at the same place, so that the line may be drained at casting, or when it is essential to stop the water going into the furnace. Such a value removes any uncertainty as to the positive cut-off of the valve controlling the water supply. A water meter is used on the spray-supply line at a few plants, and 's an excellent idea.

5.—Keep the top temperature at about 800 degrees Fahr. This temperature has been shown to require approximately the correct amount of water to prevent the gas from becoming wild, provided the blast is reduced rationally, and at the same time prevents water accumulating on top of the stock where it may cause an explosion in case of a heavy slip or fall.

6.—When the blast is taken off for any purpose, or when it is necessary to check the furnace, the water should be shut off 5 to 15 minutes before this is done, and the relief valve at the bottom of the water-supply line opened to insure that no water is going in.

7.—It is safest to keep both engines on the furnace in reducing the blast as long as they can be kept on without danger of stalling. When it becomes impossible to run two engines slowly enough and one engine alone can be kept on the furnace, it is advisable to keep the idle engine in readiness in case of any accident to the one in operation.

When the gas becomes too poor or too wet to burn, or the gas engines start to backfire, close the valves between the dust-catcher system and the gas mains. If sand or mechanical valves are used, it may be advisable to take the blast off at the next to the last cast and close them at this time rather than wait until the last moment, inasmuch as many types of these valves require considerable work, which must be done in proximity to gas, to get them closed. If no valves are provided, close the stove and boiler burners, unless the bleeder capacity is insibility of their happening is always present. When these explosions do occur they are of a most violent character, usually extending back into the manifolds and blowing tubs at the engines.

To prevent explosions or fires in the cold-blast main always close the mixer valve at the first check on the furnace; provide oil drains at the blowing rooms, and in close proximity to the stove, on the cold-blast line; and, at a stop of any description always keep the engine turning over with the snort valve open until the blowpipes are dropped. Other precautions that may be taken are: Provide a steam connection with the cold-blast line near the engine manifold, which may be turned on from the floor in case a fire develops in the cold-blast main, and if the engines are accidentally suddenly stopped close the air valves at the engine at once; in case of accidentally "losing the blast" on the furnace close the hot-blast valve and immediately open the chimney valve of the stove on the furnace. Drop the blowpipes, drafting back through another stove; install an automatic check valve in the mixer or by-pass line between the hot and cold blast mains; and, provide a check valve at the junction of the cold-blast main with the air-tub manifold, or, if the blowing engine is of the type which will turn over backwards from excess blast pressure, install an automatic stop or check device to prevent this.

British Plan for Industrial Reconstruction

An important manifesto on industrial reconstruction which has just been issued in England bears the signatures of more than 40 well-known business men and university professors, and of a still larger number of officers of trade associations. The manifesto has also the support of the editors of some 70 trade and technical journals. The scheme outlined in the manifesto is put forward as the practical outcome of all the authoratative suggestions that have been made during the last three years for the organization of British industries and the development of trade and commerce.

Concerning the needs of industrial reconstruction the signatories say that to meet the urgent needs of the times it will be necessary to increase considerably the efforts to develop British industries on the following lines:

1.—The mobilization of each industry for common action.
2.—A greater degree of co-operation between manufacturers.
3.—Co-operation between labor and capital and the avoidance of industrial strife.
4.—A more complete association between scientific institutions and traders.
5.—Education better adapted to our commercial needs.
6.—Each industry to be studied as a whole, and freed from unnecessary internal competition.
7.—Every trade to present a united front to foreign competition.
8.—Output regarded as a duty by both capital and labor.
9.—Encouragement by the government of the activities of traders, with a minimum of interference.

It is contended that the matter cannot be left to chance, and that some national scheme is necessary which shall insure the securing of these objects.

Finally the manifesto puts forward under six headings a scheme for industrial reconstruction. It is suggested that the basis of the scheme should be a vocational franchise, which would make possible the organization of each trade separately under a trade council composed of capital and labor, and the decentralization of a large proportion of national work now attempted by government departments. The government, it is proposed, should establish a department to promote or encourage trade, and the first function of this department should be to create representative trade councils in every trade. It should be assisted by an advisory council, consisting of the chairman of all the trade councils, and should comprise special departments for export and tariffs, industrial and scientific research, commercial education, statistics and finance, welfare and exhibitions.

Generally, the scheme involves the establishment of a complete new system of trade government comparable to our existing system of local government, with a ministry at the head with powers similar to those of the local government board, controlling numerous trade councils, with powers comparable to those of existing county councils. It recognizes the essential principle that industrial interests should be grouped by trades and not by localities.

Functions of the Purchasing Agent

A Comprehensive Record of the Available Sources of Supplies and Kindred Information Relative to Costs Should be Embodied Into a Convenient System by Every Purchasing Agent

BY WILFRED G. ASTLE

WHAT is the main function of a purchasing department? It is to buy all materials, supplies and equipment. This is considered one of the first great steps in distribution and one of the most important functions in that complex structure called business. The purchasing department is responsible for the buying of all the raw material which eventually is worked into some kind of a product, all supplies and equipment necessary for the manufacture and handling of the material, and all other supplies that are required to satisfy the daily wants of business. The function of this department is considered one of the most important in a modern business organization because the buying of material, especially raw material, is the first expense incurred in the cost of manufacturing an article. The same principle applies in merchandising and construction work, because, in merchandising, you must buy an article before it can be sold, and in construction work, you must buy tools and equipment before the workmen can start operations. There are thousands of business men all over the country who are helping to set distribution right by careful buying according to tested principles.

Before describing the details surrounding the methods and system used by a purchasing department of a large manufacturing company, it may be well to make a few general remarks regarding the practice to be followed if the department is to render the maximum service to the organization. It is the intention to outline a system in which the requisition or supply order, as issued by the storekeeper or department head, will be the nucleus around which all the departmental functions are centered. In order that the purchasing agent can buy intelligently, it is necessary that these supply orders should convey complete information, including a correct technical description of the material wanted, as well as shipping instructions, and a statement of the quantity on hand, the time it will last and the earliest date when the material will be required in the plant.

Uniform System Recommended

As far as possible, uniform standards should be adopted for buying all materials and supplies. When this is done, it will lessen the work of the purchasing department, and it will also facilitate a more satisfactory placing of long-time contracts and the securing of much lower prices. It is easy to see the truth of this statement, for when manufacturers are furnished with minute specifications, and when the specifications are standard, they can always figure more closely on prices. Where standards are not uniform, or where materials ordered are of special character, the manufacturer will always make a liberal allowance for uncertainties, and this operates naturally to the detriment of the purchasing agent.

The first step in the creation of a successful purchasing department is the selection of the right man for purchasing agent. What qualifications are needed? Integrity is the first, coupled with good judgment and wide information. He should be capable of taking care of the administrative work as well as the detail work, because it is impossible for the successful purchasing agent to eliminate details entirely. It is of paramount importance that he should keep his hand on the pulse of the entire organization. Being able to forecast accurately the market movements and price fluctuations is another desirable qualification that a purchasing agent should have. He should also be a man of personality, with broad ideas on all business subjects, and should be able to impress salesmen who call on him that he knows his business thoroughly and cannot be sold on any but the right proposition.

The importance of giving the purchasing agent a free hand is being recognized more and more by progressive firms. If manufacturers and supply men are given to understand that the purchasing agent is the court of last resort in all matters affecting purchases, it will give him a prestige invaluable in business transactions. On the other hand, if it becomes known that salesmen can go over the head of the buyer, or if they can go to the purchasing agent knowing that they will receive the order without difficulty, they will never quote their lowest prices, and the purchasing agent is at their mercy. It is very plain that this, naturally, will operate to the lasting disadvantage of the organization, making the position of purchasing agent a mockery.

To get away from this condition, it is absolutely necessary that the purchasing department should be recog-

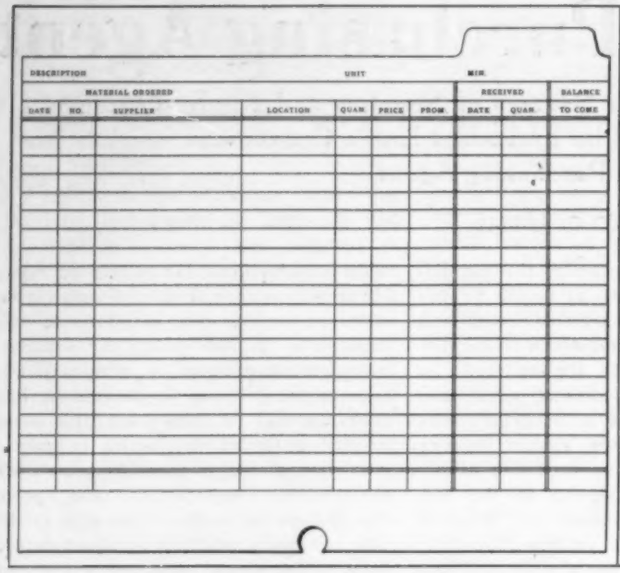
MATERIAL

FIRM NAME	ADDRESS	SHELF	CAT. NO.

FIG. 1—FORM USED TO RECORD ITEMS CONTEMPLATED FOR PURCHASE

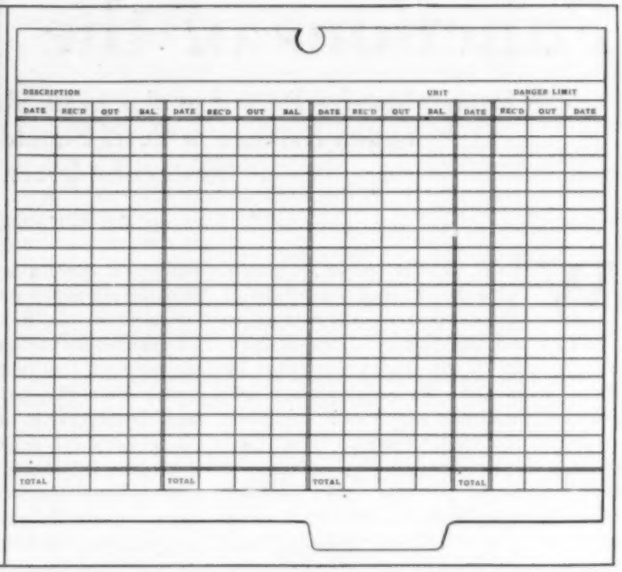
FIRM NAME	CAT. NO.
ADDRESS	SHELF
ARTICLES	ARTICLES

FIG. 2—INDEX OF FIRMS SHOWING WHERE SUPPLIES MAY BE OBTAINED


DESCRIPTION UNIT MIN.

MATERIAL ORDERED							RECEIVED		BALANCE
DATE	NO.	SUPPLIER	LOCATION	QUAN.	PRICE	FROM	DATE	QUAN.	TO COME

FIG. 3—A RECORD OF PREVIOUS PURCHASES MAY BE CONVENIENTLY MAINTAINED ON SUCH A FORM


DESCRIPTION UNIT DANGER LIMIT

DATE	REC'D	OUT	BAL.	DATE	REC'D	OUT	BAL.	DATE	REC'D	OUT	BAL.	DATE	REC'D	OUT	DATE
TOTAL				TOTAL				TOTAL				TOTAL			

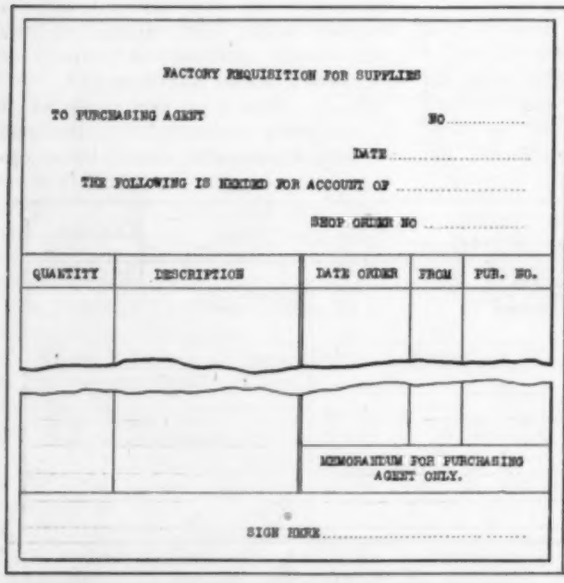
FIG. 4—A RECORD OF MATERIALS AND SUPPLIES REQUISITIONED IS ALMOST INDISPENSABLE

nized as the one department having charge of such matters. Do not think for one moment that this means that the purchasing agent should entirely ignore recommendations made to him from time to time by department heads, or by the engineers in the employ of the organization. But it does mean that all information regarding specifications and requirements should come through his department. This should be made a strict rule. Sometimes it is advisable to have department heads make recommendations, and the committee system is sometimes used to great advantage in aiding the proper selection of material. In the matter of purchases, however, department heads should not be allowed to go beyond recommendations.

The following rules regarding purchases which were taken from the regulations of one of the most prominent railway companies are pertinent:

1. In making contracts and purchases, the purchasing agent will be guided by his best judgment, taking into consideration quality, prices and the recommendations of responsible heads of departments.
2. Negotiations regarding contracts and purchases and the correspondence relating thereto will be conducted by the general purchasing agent; requests for information about articles, the use of which may be contemplated, will be made through him.
3. Information relating to quality and performance of materials, supplies, tools, track appliances, etc., will be furnished to outside parties by the general purchasing agent only, and all requests for information made by such parties, either verbally or in writing, will be referred to him.

A library of catalogs should be maintained in every purchasing department. The trade publications also should be so filed that the purchasing agent can at all times lay his hand on any particular issue without delay. One of the trials of purchasing agents is that hardly two catalogs are of the same size or style, which makes it necessary to have many different sizes of filing cabinets to accommodate them. Efforts have been made for years to standardize catalogs, but little has been accomplished. This matter is now being taken up by the National Association of Purchasing


FACTORY REQUISITION FOR SUPPLIES

TO PURCHASING AGENT NO.....

DATE.....

THE FOLLOWING IS NEEDED FOR ACCOUNT OF .....

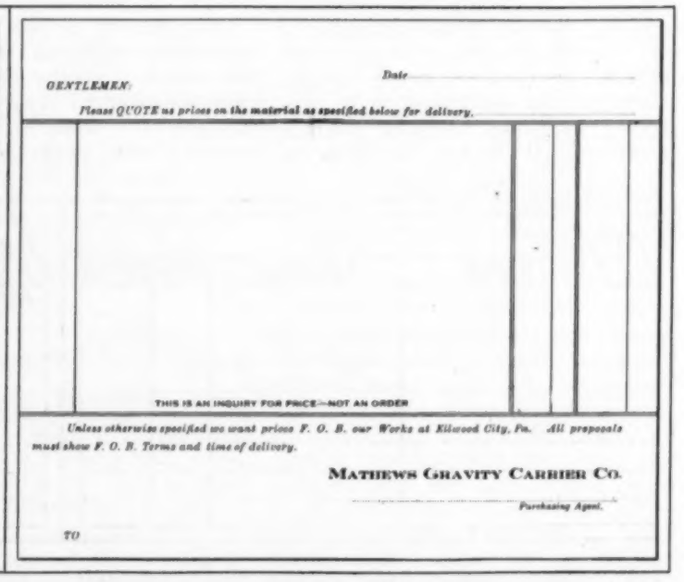
SHOP ORDER NO .....

QUANTITY	DESCRIPTION	DATE ORDER	FROM	PUR. NO.

MEMORANDUM FOR PURCHASING AGENT ONLY.

SIGN HERE.....

FIG. 5—A TYPICAL SHOP FOREMAN'S REQUISITION OR SUPPLY ORDER


Date.....

GENTLEMEN:

Please QUOTE us prices on the material as specified below for delivery.

THIS IS AN INQUIRY FOR PRICE—NOT AN ORDER

Unless otherwise specified we want prices F. O. B. our Works at Kilwood City, Pa. All proposals must show F. O. B. Terms and time of delivery.

MATHEWS GRAVITY CARRIER CO.

.....
Purchasing Agent.

TO

FIG. 6—FORM USED WHEN BUYING SUPPLIES ON WHICH NEW QUOTATIONS MUST BE OBTAINED

TABULATION OF BIDS.

ARTICLE.....

DESCRIPTION.....

BIDS CLOSED.....

Name of bidder	Price per...	Total price.	Size or weight.	Terms F.O.B.	Shipment delivery

Job.....Approx. quantity....
Order No.....To.....Authorized by.....Placed by .....Reason.....

Job.....Approx. quantity....
Order No.....To.....Authorized by.....Placed by .....Reason.....

Job.....Approx. quantity....
Order No.....To.....Authorized by.....Placed by .....Reason.....

Job.....Approx. quantity....
Order No.....To.....Authorized by.....Placed by .....Reason.....

FIG. 7—ALL QUOTATIONS SHOULD BE TABULATED

PURCHASE ORDER

SHIP TO **MATHEWS GRAVITY CARRIER COMPANY.**

ELLWOOD CITY, PENNA.

TO

ADDRESS

Gentlemen: Please furnish us with the material itemized below:

SHIP VIA

ORDER No. 4002

Date

Acknowledge receipt of this order AT ONCE on the attached form, specifying shipping date and price on all material.

Render invoices in DUPLICATE.

Retain this copy for your file.

TERMS F. O. B.

DISCOUNT DAYS.

QUANTITY	MATERIAL REQUIRED	@	COST	DATE OF DELIVERY

1 IMPORTANT—Return attached acknowledgment AT ONCE filled in as requested above. DUPLICATE INVOICES of all shipments required.

MARK PACKAGES:

MATHEWS GRAVITY CARRIER COMPANY.

Purchasing Agent.

FIG. 8—A SPECIMEN PURCHASE ORDER BLANK

Agents, and it is to be hoped that some system will be devised to do away with this trouble. In the meantime, it is necessary that we use a good system for indexing the present catalogs so that they can be found easily. One satisfactory method of filing is to divide the catalogs into groups according to sizes. Each of these groups would be given identifying letters, as *A*, *B*, *C* and *D*. Catalogs in any given group are numbered; these numbers are consecutive under each group. For example, a 3 x 5-inch catalog may be given the number *A*-36 (the letter indicates its group); a 4 x 6-inch catalog might have the same number, but the letter would be *B* and so on. The catalogs should be filed in vertical drawers for the smaller ones, and bookcases for the larger bound volumes.

Complete Records Important

The first essential element in a purchasing system is an accessible record of every article that may have to be purchased. This may be entered on what usually is called a subject index, similar in form to Fig. 1. This record should be filed alphabetically with suitable index cards. Each class of article and each grade or size should have a permanent stock number, which should appear on all records in connection with the name or other reference to the material.

To supplement the subject index there should be maintained a firm index similar in form to Fig. 2, which shows a typical arrangement. This should be filed in the same manner as the subject index. One is merely a cross reference for the other. It is always advisable to have these two records of a different color, as a precaution against their being placed in the wrong filing drawer.

The record of sources from which material and supplies may be obtained should be revised constantly and kept up to date. It is not sufficient to keep a list of manufacturers from whom purchases are regularly made. They may be the ones who have been best able to supply requirements in the past and perhaps at the present, but changes are continually taking

ACKNOWLEDGMENT OF ORDER

RETURN THIS FORM AT ONCE TO **MATHEWS GRAVITY CARRIER COMPANY.**

ELLWOOD CITY, PENNA.

TO

ADDRESS

Gentlemen: Enter prices opposite ALL ITEMS not priced below, and specify dates upon which you will make shipment. This order is subject to CANCELLATION if not acknowledged within ..... days.

SHIP VIA

ORDER No. 4002

Date

Return this form at once to MATHEWS GRAVITY CARRIER COMPANY ELLWOOD CITY, PENNA.

Must be properly filled out as to dates and shipment.

TERMS F. O. B.

DISCOUNT DAYS.

QUANTITY	MATERIAL REQUIRED	@	COST	WE WILL SHIP

2 **ACKNOWLEDGMENT**

N. B.—Do not say you will make shipment "as soon as possible," but specify the date as closely as you can.

WE WILL MARK PACKAGES:

MATHEWS GRAVITY CARRIER COMPANY,
Ellwood City, Penna.

Gentlemen: We will make shipment of this order on the dates mentioned and at the price and terms specified.

(Sign here) .....

By .....

FIG. 9—ACKNOWLEDGMENT FORM USED WITH ORDERS PLACED BEFORE QUOTATIONS HAVE BEEN OBTAINED

TRACER REQUEST.

Gentlemen:

Please trace shipment forwarded

From To

Via

Consisting of

Please advise immediately by way-billing references, connecting lines, date of delivery, etc.

Yours very truly,

MATHEWS GRAVITY CARRIER CO.

Purchasing Agent.

FIG. 10—A PRACTICAL FORM USED TO TRACE SHIPMENTS THAT HAVE BEEN LOST IN TRANSIT

place and new manufacturers are coming into the market who possibly are better equipped than the old ones. A wealth of valuable information may soon be accumulated and recorded on cards if the market is assiduously searched.

A simple form for recording previous purchases is shown in Fig. 3. This form may be elaborated as necessary, so long as useful information is being recorded, but duplication should be avoided. On the reverse side of Fig. 3 may be kept a record of the material received and requisitioned out from the storeroom, as shown in Fig. 4. This is only advisable when perpetual inventory of stock is kept in the purchasing office.

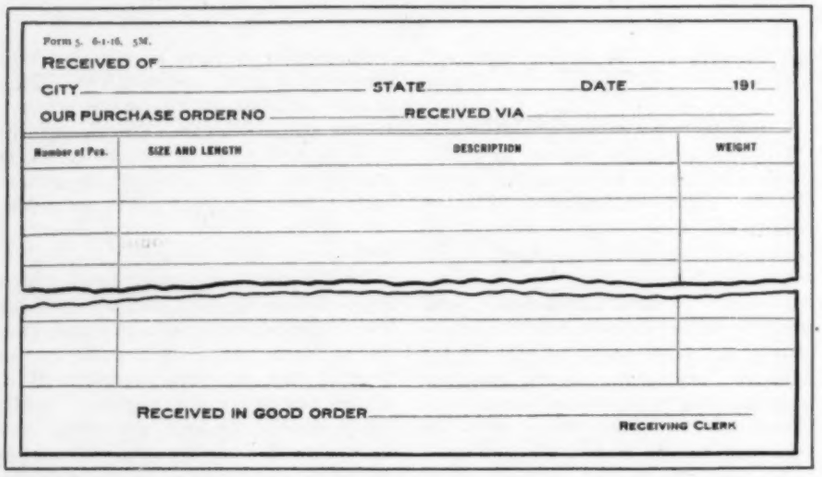
The supply order or requisition, which originates in the storeroom or from some department head, is, as previously stated, the nucleus around which all the departmental functions are centered. Each department or storeroom from which orders originate should be furnished with forms in duplicate; the original is forwarded to the purchasing agent; the duplicate is retained for departmental information. A suitable form of requisition or supply order is shown in Fig. 5. Each department or storeroom should be given a symbol to be used in identifying its orders which should be numbered consecutively. Orders should have the approval of the heads of departments in which they originate, and, in addition, the superintendent or factory manager should place his approval on them before they are sent to the purchasing department.

When a requisition or supply order covers material for which there is no agreed price with the supplier, or when the price agreement expires, new quotations must be obtained. For this purpose a form similar to Fig. 6 may be used. Reference should be made to the supply cards already described, and inquiries sent to as many firms as are necessary to get lowest prices, best material and suitable delivery. A copy of this inquiry with a list of all firms to which it was sent should be kept with the supply order until finally disposed of. In tabulating quotations received a record similar to Fig. 7 can be used.

After quotations have been received and tabulated, the purchase order can be made out. Purchase order forms vary considerably; in fact, it would be difficult to find two with exactly the same wording, but there are essential features in all which are intended to convey the same interpretation. In the body of the order it is axiomotic that typographical errors should not occur. It is obvious, too, that the description of material should be exact and free from ambiguity, to preclude errors in execution. Fig. 8 is given as a specimen purchase order. Some purchase orders are sent out with an attachment for acknowledgment, but this is not recommended, because it is generally treated in a very perfunctory manner. A very good practice, and one that has given very good results where used, is to enclose a duplicate copy of the order with spaces for giving the promised date of shipment as well as the price in cases where the order is sent out before obtaining quotations. Fig. 9 shows an acknowledgment form. The habit of sending out orders without knowing what the price will be, is considered bad practice, but in some cases it is unavoidable.

Several copies of the purchase order should be made. One copy usually is sent to the department which made the requisition, sometimes a copy to the storekeeper and sometimes to the accountant, and generally to the receiving clerk. It all depends on the methods in vogue. All copies should be distinctive in color, as this facilitates distribution and prevents any mix up. The copy kept in the purchasing office is used to trace the order, and after the order has been shipped, to trace shipment. The invoices and receiving report are also checked from this copy. Fig. 10 shows a form used to trace shipments which is self-explanatory.

In order to insure against the payment of bills for material which has never been received, or which is not in accordance with specifications, some system of receiving should be adopted. The nature and size of the business naturally will determine the system to be used. The form shown in Fig. 11, which may be made in as many copies as desired, according to the organization of the business, is simple and comprehensive enough to fit almost any condition. The method to be followed in receiving materials is about the same in all lines of business. As soon as the receiving clerk receives a shipment of material he goes to his file of notices to ascertain where the material belongs. He then fills in the receiving report, but first he checks thoroughly to make sure that the material is as specified. The original copy is immediately sent to the purchasing department, where it is checked against the purchase order and is then attached to the invoice. After the invoice has been checked it is forwarded to the accounting department with the receiving report attached to it.


Form 5. 6-1-16. 5M.

RECEIVED OF _____

CITY _____ STATE _____ DATE _____ 191__

OUR PURCHASE ORDER NO _____ RECEIVED VIA _____

Number of Pcs.	SIZE AND LENGTH	DESCRIPTION	WEIGHT

RECEIVED IN GOOD ORDER _____

RECEIVING CLERK

FIG. 11—THE RECEIVING DEPARTMENT ACKNOWLEDGES MATERIALS

The manager of a western plant says there is a fourfold test of good buying, and that the purchasing agent must satisfy four people—the plant superintendent, the foreman, the president or general manager, and the treasurer. The plant superintendent wants the material on hand when it is needed; the foreman wants the right material; the president or general manager wants the material bought at the lowest economical price; and finally, the treasurer wants the investment in materials kept down to a mimimum.

I do not say that this system will meet all needs, but with a few changes to meet individual conditions, it can be adapted for use in nearly all cases. Whatever may be the changes in detail, due to the requirements of the individual business, the general nature of the buying data to be recorded remains about the same in all instances. There are but few industries in which the demand for a suitable system of purchasing cannot be met by some application of the fundamental principles that are the basis of the system described.

Limitations of Carbonizing Process

A Discussion of the Factors Restricting the Satisfactory Use of Carbonized Steel—The Author Shows How High-Carbon Steel is Adapted to Various Conditions

BY E. F. LAKE

IN SPITE of all the improvements that have been made in the composition of steels and the methods of their manufacture, the carbonizing process is still used in the manufacture of some important machine parts. Probably the automobile industry uses more carbonized parts than all others put together and yet, strange to say, it boasts more about being the instigator of many new processes and methods for manufacturing steels of greatly improved quality. It also boasts of having brought into practical use many new alloys which doubled and tripled the power of the steels formerly used to resist alternating vibrational strains and also the rotary vibrational and torsional strains.

Low carbon steel can be machined more rapidly than one high in carbon and this is one of the reasons why the carbonizing process has remained in vogue. Stellite and the improved high-speed steels have reduced this difference in machining time, and this argument is rapidly losing its force. Against the argument of the saving in time in the machine shop, we must figure the cost of carburizing material, of carbonizing furnaces, of fuels to operate the furnaces, of the time required for packing the steel parts, charging the furnaces, removing the work from the furnace for quenching and again reheating the parts for the second hardening. When that is done we will find that the carbonizing process is rather expensive.

The principal argument advanced in favor of carbonized steel parts is that they have a hard outer surface that will resist wear on such parts as gear teeth, cams, etc., and a tough center that will prevent breakage. When this statement is analyzed carefully, however, we find it does not prove to be true. For instance, bronze gears running in mesh with carbonized steel gears outwear the steel gears. Yet, hardness testing machines show that carbonized steel gear teeth have several times the degree of hardness that bronze gears possess.

Another example is that Hadfield's manganese steel, when made into gears, will wear longer than four or five carbonized steel gears. These show their greatest efficiency when used on stone crushers or similar machines, where the gears are subjected to the grinding action of mineral dust. This manganese steel is the toughest steel known, yet it does not show anywhere near the degree of hardness of a high carbon steel. Numerous other examples could be cited, but these facts indicate that hardness alone is not the property that will give the greatest wear to two surfaces which are rubbing against each other.

Elastic Limits Deceiving

It is folly to claim "a tough center that will prevent breakage" for the steels containing from 0.12 to 0.18 per cent carbon, which are usually used for carbonized parts that contain approximately 1.00 per cent of carbon in the outer shell. The carbon steels in this class seldom have an elastic limit of more than 40,000 pounds per square inch, and this cannot be increased much more than 5000 pounds by any kind of heat treatment. When this is exceeded the teeth of gears become deformed; will not mesh properly and soon fracture. To overcome this weakness, the piece must be designed heavier than need be if made from a high carbon steel hardened and tempered properly, without being carbonized.

A 3½ per cent nickel steel, of the carbonizing grade, might have the elastic limit of the soft core raised to 80,000 pounds per square inch, but this could be increased to 160,000 pounds per square inch if the piece were made from a grade that contained enough carbon to be hardened and tempered, without carbonizing. Likewise, a vanadium steel, of the carbonizing grade, would not have an elastic limit of more than 100,000 pounds per square inch in the center, and this could be raised to some 200,000 pounds if we did not resort to the carbonizing process. The nickel-chrome steels which are the strongest and toughest steels known, can have their elastic limit raised to something like 250,000 pounds per square inch. Ordinary carbon steels are carbonized in much larger quantities than all the alloy steels put together. If we use such a steel, with a high enough carbon content to give the best wearing surface, the elastic limit may be raised to more than 100,000 pounds per square inch, compared to 40,000 to 45,000 pounds in the core of a steel that is carbonized. It is believed that straight carbon steel will resist twice as much load as the core of the carbonized steel, before it would stretch enough to take a permanent set. The elongation and reduction of area, of the soft steel, will be double that of the harder steel. These, taken together, usually indicate the ductility of the metal, which is the opposite of brittleness. They might indicate that the softer steel would withstand the greatest transversely applied load, or torsional load. In commercial work, it would probably mean that soft core of a carbonized piece would bend before the hardened and tempered, high carbon steel would break. Distortion is just as undesirable as breakage in a piece that must fit others. Distortion will either cause the piece itself to break, or it will break up other pieces with which it comes in contact. Frequently both occur. Therefore, there is nothing gained by having a soft, ductile center and a hard outer shell.

Carbonized parts are always used where two surfaces rub together on the assumption that a hard outer surface will cause steel to resist wear longer than otherwise would be the case. Extreme hardness produces the martensitic or austenitic structures. This extreme hardness in steel carries with it a brittleness which causes the steel to wear away quicker than when it is drawn back enough to show the troositic structure. And this reduces the brittleness to a certain degree of toughness. The examples, previously given, of bronze and manganese steel gears outwearing carbon steel gears are evidence of this fact. Another example is the ability of files to cut glass. It is generally recognized that glass is considerably harder than a steel file, but the glass is so extremely brittle that the file keeps breaking away particles of the glass until it is cut to the desired size or shape. The same thing occurs when a hard steel gear, or other

From a paper read before the Steel Treating Research Club of Detroit, April 27, 1917.

part, is worn away by a softer but tougher metal. Therefore, toughness is more important than hardness. We may select steels that will give us the correct degree of hardness and toughness when they are merely hardened and tempered and thus do away with the carbonizing process. We will then have machine parts that are as strong in the center as they are on the outside, and we may then reduce their sectional area, or the pounds of steel that are used for a given performance.

Tests Show Difference in Steels

One series of transverse tests was conducted with pieces ½ inch round and 12 inches long, loaded at the center between 10-inch supports. The best results that were obtained with carbonized steel was a load of 1750 pounds with a deflection of ½-inch, while a straight oil-hardened steel withstood a load of 3025 pounds, with a deflection of 1.55 inches. The carbonized steel was an electric furnace, chrome-vanadium steel, containing 0.20 per cent carbon, before being carbonized. The straight hardened and tempered steel was an electric furnace chrome-vanadium steel containing 0.50 per cent carbon. Both were practically the same steel except for the carbon content. The outer shell of the carbonized steel had the carbon content raised to 1.22 per cent, while at a depth of 0.20 inches it decreased to 0.30 per cent. An electric furnace nickel steel, with an original carbon content of 0.31 per cent withstood a load of 1950 pounds, with a deflection of 0.62 inch, after being carbonized. The outer shell contained 0.95 per cent carbon. The best results obtained with carbon steels that had been carbonized were a load of 1050 pounds, with a deflection of 0.50 inch; 1020 pounds, with a deflection of 0.61 inch; 950 pounds, with a deflection of 0.44 inch. The original carbon content was 0.15, 0.20 and 0.25 per cent, respectively. This was raised to 0.90 and 0.95 per cent in the outer shell. The tensile tests show such poor results on carbonized steels that no one thinks of using them. Therefore we cannot give comparisons at this time. Suffice it to say that the elastic limit is seldom one-half of that of a high-carbon steel that is properly heat-treated.

In the early days of the bicycle, ball and roller bearings first came into general use. Then the cups, cones, races and even the balls and rollers were carbonized. The manufacturers soon learned, however, that the hard outer shell of the balls would compress against the soft center and cause them to deform. When that occurred the bearing soon failed. Many of the balls would also check and crack between the hard outer shell and the soft core and cause the shell to peel off. Next, they resorted to a straight carbon steel and gave the balls a uniform hardness clear to the center. They then found that a given size of ball would carry a much larger load. Later they found that a chromium steel was the best thing that could be used for balls. At present the chromium varies from 1.00 per cent to 1.75 per cent, according to the size of the balls. As to the carbon content, a eutectoid alloy is considered the best and a steel containing from 0.85 per cent to 0.90 per cent carbon is generally used. There should be no trace of manganese, no trace of silicon, less than 0.02 per cent sulphur and less than 0.015 per cent phosphorus. The chemical composition amounts to nothing unless the steel is homogeneous and is afterward heat treated accurately. The ball races are turned from bars of this same steel.

That many parts of roller bearings are still being carbonized is due to the fact that a roller has a comparatively larger bearing surface than a ball. As a consequence, the weakness of carbonized parts do not develop as quickly as they did with ball bearings, and roller bearing makers have not learned their lesson as quickly as did the manufacturers of ball bearings. Nevertheless, there is a steady growth in the number of roller bearing parts that are being given a straight hardening and tempering without carbonizing. If it were not for the efficiency of the salesman this change might have been brought about long ago.

Steel Should Not Peel

In carbonizing steel there are many difficulties to overcome, and it is doubtful if we overcome them all in any given amount of metal carbonized. There is no distinct bark to shell off, as the carbon content will gradually reduce from something like 1.25 per cent on the outer surface to the 0.10 to 0.20 per cent of the original steel in the core. In commercial work, however, there is nearly always a distinct demarkation between the zone of high carbon and the core. It has been demonstrated that a high carbon steel increases in volume much more than a low carbon steel when hardened. Therefore, there is considerable straining between the high carbon and low carbon parts of a carbonized piece every time it is hardened. This often results in rupture parallel to the outer surfaces. Such a rupture is seldom seen until the carbonized part has failed in service. Here again, however, the factor of ignorance can be made large enough to cover up such defects.

Many Difficulties to be Met

One series of tests with nickel steel showed that the specific gravity was greater after carbonizing than when the same steel was hardened without carbonizing. This is the direct opposite of the effect obtained with carbon steels. Therefore, if the strains were great enough, they would burst the outer shell and develop cracks that could be seen. Another difficulty to overcome is the segregation of carbon. This can easily be caused by a raising and lowering of the temperature of the furnace during the time of carbonization. This nearly always occurs in coal-fired furnaces. In the rush of manufacturing it very often occurs with furnaces that are fired with the best of fuels.. It might be caused by a carbonizing mixture that was not uniform. Microscopical examinations of one test also showed the segregation of cementite to be the most frequent in the pieces that were in the top of the carbonizing box. Such segregation often causes thin plates to flake off from the surfaces. A third difficulty to overcome is that of grain-growth and this is the most difficult of all. The carbonizing steels that contain below 0.18 per cent of carbon are very susceptible to grain-growth. The grain starts to increase in size as soon as the transformation point is past, which in this steel is around 1550 degrees Fahr., and continues to grow until the highest temperature is reached during the carbonizing process. In commercial work this is often 1750 degrees and is seldom below 1700 degrees. This brings us close to the point of crystallization, and when that occurs the steel will retain the coarsened grain structure. If not, and the work is quenched from the carbonizing furnace, the coarse grain is very liable to stay in the core, even though the work is again heated to a temperature high enough to harden the high carbon outer shell. Therefore, it is only with the utmost care that the core can be made much better than a filler for the shell. A steel that is high enough in carbon to begin with and then is hardened and tempered correctly, does not encounter these three difficulties. Carbonized steel has its uses, but from a practical standpoint the value of alloy steels that can be used in a soft state should not be overlooked.

Heat Hazards—An Industrial Waste

Exposure to Undue Heat Causes a Lowered Physical Tone in Workers—Heat Hazards and Mitigating Measures Explained by a Health Authority

BY DR. J. A. WATKINS

IN SEVERAL of the large industries of the United States, particularly in certain departments, the temperature to which workers are exposed is exceedingly high and in many instances is accompanied by unusual conditions of humidity. A partial list of these industries is as follows: Sugar refineries, paper mills, flax mills, laundries, tanneries, large kitchens, stoke holes and firerooms of ships, glass factories and iron and steel works.

Though the temperature of the body in health fluctuates somewhat during the day, it is maintained in rather narrow limits by regulation of the amount of body heat produced and the amount lost. The normal temperature of the body (about 98.5 degrees Fahr.) is an expression of the resulting balance between heat production and heat loss. The ill effects of high external temperature upon the body are the result of a disturbance of this state of equilibrium.

The loss of heat by the body is a physical process. It takes place principally by conduction and convection, by radiation and by evaporation. Without means by which the body heat could be lost as it is produced, the temperature of the body would soon rise to a degree at which bioplasm is destroyed and life must cease. When the loss of body heat is only partially prevented, severe symptoms rapidly ensue. The rate of heat transfer, other conditions being equal, diminishes as the temperature of the air rises. The rate of heat loss by evaporation diminishes as the relative humidity increases. As a general effect of diminished heat loss, the temperature of the skin is raised, i. e., its specific radiating power is increased, which, besides aiding in evaporation, facilitates heat transfer. A decrease in the amount of heat lost by one means is compensated, to a certain extent, by an increase in the rate of that lost by another.

While if the loss of body heat be prevented, severe symptoms rapidly ensue, it should be understood that the ill effects of a disturbance of the heat equilibrium do not become manifest solely in acute illness, such as heat stroke or heat exhaustion; but that the most common effect of chronic exposure to excessive heat is lower physical efficiency of the worker so exposed and diminished resistance to fatigue and disease. Workers exposed to heat hazard eventually drop out because of decreased working powers, poor health or some degenerative disease for which predisposition has been created by reason of the working conditions. It is unusual, however, to find the heat hazard to which the worker has been exposed assigned its true role as the cause of this poor state of health. The conditions of heat and humidity in many working locations are such that it is a physiological impossibility for full bodily efficiency to be maintained, not only because of the attendant discomfort, but because the body encounters physical and physiological problems with which it was never constituted to cope continuously. Many of those who have been continuously employed on the so-called "hot jobs" will state to a visitor that they have become "used to" the conditions present. In most instances, however, casual observations of the physical condition or appearance of such persons is sufficient to show that their statements are made to impress the questioner, who is much inconvenienced by the conditions present. In some instances limited adaptation apparently has taken place. This is very probably a result of experience rather than the true physiological adaptation, for such exposed men soon learn to reduce the amount of physical exertion to a minimum, to dress to meet the conditions, and in some instances instinctively to alter their diet.

The effects of long continued exposure to this hazard are slow and insidious and are evidenced in degenerative changes such as arthritic and muscular rheumatism, chronic skin disorders and arteriosclerosis. In addition, long-continued exposure to excessive heat will gradually but surely lower the general physical tons of a worker even though no special disease conditions become evident.

The effects of undue exposure of workers may be mitigated by preventing the heat from reaching the workers after it has been radiated. In order to minimize heat radiation, the source should be insulated. When insulating a source of heat of large dimensions or covering extensive heat generating surfaces, such as the heating furnaces, double walls of fire brick separated by an air space are very efficient. Where insulation of the source is not practicable, other means of mitigation must be resorted to. The first step in this direction should be taken in the beginning, when the buildings to house the various departments are designed.

Buildings devoted to hot processes should be large, high-roofed, with ample floor space, and provided with large openings in the walls and roof to facilitate natural ventilation. Such provisions will aid greatly in carrying off superheated air. Electrically driven ventilation and exhaust fans, if of sufficient size and properly placed and operated, are excellent. In some locations the radiant heat will be so great that measures taken for the protection of workers will prove inadequate. In such cases the installation of screens between the source of heat and the worker has been found to be of advantage. These screens are built of various materials according to conditions existing in the working locations. Brick shields are efficient, but have the disadvantage of being stationary, which

For Service Not Sentiment

EVERY fighting man at the front must be backed by many in the shops and factories of America. The problems of conserving labor and of obtaining the maximum service from workers are of national significance. Maximum service is dependent upon health and physical tone, conditions which are menaced by the heat hazard in many industries. Dr. Watkins explains these hazards, and offers some timely suggestions for their mitigation.

in many instances is undesirable. In such cases, portable screens made of steel or steel faced with asbestos are satisfactory. Where the worker must look at the source of heat in the performance of his duties, it is necessary to install transparent screens. For this purpose wire mesh may be used and the shield made either portable or stationary as the conditions demand. Wire mesh screens intercept much heat. A fine spray of water falling between the source of heat and the worker is sometimes used, but though efficient, this method should not be used except in locations where the relative humidity is low. In some instances screens, besides being necessarily transparent, must be of such a character as to permit the worker to pass beyond them toward the source of heat. A screen which will stop a great deal of radiant heat, yet which can be readily displaced, is made of chains hung down in rows from a crossbeam. When necessary, the worker pushes them aside and passes through, but immediately upon returning is again protected.

Air Current Satisfactory

Another protection method is that of causing a strong air current to pass from below upward just in front of the sources of heat. While aiding ventilation to some extent, this does not act as a very efficient screen, and is not as practical as a forced air current directed from behind the worker toward the source of heat. This method has proved very satisfactory at tube-welding furnaces. The air blast must be strong. None of these methods are practicable in the case of certain "hot jobs", and here it is necessary to place the protective device on the man himself. Among these may be mentioned goggles, wire mesh face masks, asbestos aprons and leggings. Where employes handle hot materials, metal-faced gloves give satisfaction. Wooden or green leather soled shoes, or shoes which have a layer of asbestos, cork or similar poor conductor placed between the outer and inner layers of the sole, will greatly aid in protecting the feet of the workers who are required to stand on heated surfaces, as for example, around the soaking pits in a steel plant.

Clothing acts as an insulator and interferes both with heat transfer and evaporation of moisture because it is usually made of substances of feeble conductivity which entangle air in the mesh. Thus, if the conductivity of silver be taken as 493, that of wool or cotton is about 0.04 and that of air is 0.000288. Therefore, where high temperatures must be sustained, exposure of the body surface is indicated. This, however, cannot be carried out in working locations where the abnormal conditions of temperature are due to radiant heat as the workers are forced to wear additional clothing to avoid actual injuiry to the skin.. In actual practice it is found that by wearing clothing of a certain character, heat transfer is facilitated, for the clothes become wet with perspiration and as water is a better conductor than air, a more rapid loss of body heat takes place. It has been shown experimentally that an arm enclosed in a calorimeter and wrapped in flannel will lose in an hour about 4.5 calories. If the flannel is wet, however, the loss is increased to 22.7 calories. In addition evaporation takes place as rapidly from the surface of the clothing if heated from the body as it will from the surface of the body itself. The type of clothing, therefore, indicated as of best service is thin, light and with good absorptive properties. Cotton clothing meets these requirements. However, the use of such garments adds a hazard, for the worker after leaving his place of work in a hot and wet condition, cools off too rapidly and symptoms of internal congestion and catarrhal conditions of the respiratory tract may ensue. Workers cannot be relied upon to take the necessary precautions to avoid the hazard. Woolen clothing, therefore, is better, as it will perform most of the desired functions satisfactorily and yet does not allow too rapid cooling off to occur.

Since so much body water is lost under conditions which provoke free perspiration, it is important that an ample amount of water be drunk to replenish the tissues thus deprived of their normal water content. Without this, their proper functions will be hampered and health and efficiency cannot be expected. The worker should be furnished an abundant supply of water together with drinking facilities which are clean, attractive and placed so as to be conveniently accessible at all times. The water should never be below 55 degrees Fahr. in temperature, as the drinking of cold water is likely to cause gastrointestinal disorders. The jet sanitary fountain is the best drinking facility. Though under ordinary conditions the amount of heat lost in bringing the temperature of water up to that of the body is small, this amount, by judicious drinking, can be increased. Water should be drunk in small quantities and at frequent intervals, not in large quantities at infrequent intervals.

The amount of heat generated by the body may be diminished by, first, reducing the amount of physical work and, second, by regulation of the diet. With the invention of new machinery and the introduction of many labor-saving devices, much physical work has been done away with, as for example, by mechanical stoking devices. There is still, however, much work of a laborious character to be done. Such activities produce a great deal of body heat. Thus it has been shown that a soldier weighing 154 pounds while at rest produces 1.3 calories per minute, but while he marches with a load of 68 pounds, he produces 7.8 calories per minute. This amount of heat is sufficient to raise the body temperature one degress in less than nine minutes. Workers, therefore, exposed to abnormally high temperature or humidities should not be required to perform much physical work in the aggregate. It is worthy of note that by means of diet the rate of heat production has been experimentally increased by 44 per cent. Where work must be performed under heated conditions, the intake of meats and fats should be reduced and the consumption of starches, fruits and green vegetables increased.

Book Review

Hendricks' Commercial Register for Buyers and Sellers, issued by S. E. Hendricks Co., Inc.; cloth; 2209 pages, 7½ x 9 inches; published by the S. E. Hendricks Co., Inc., and furnished by *The Foundry* for $10 net.

The twenty-sixth annual edition of Hendricks' Commercial Register of the United States has just been issued by the publishers. The book has been revised, corrected and brought up to date. It is especially devoted to the interests of the architectural, contracting, electrical, engineering, hardware, iron, mechanical, mill, mining, quarrying, railroad, steel and kindred industries. Full lists are included of producers, manufacturers, dealers and consumers. All products, from the raw material to the finished article are also included.

The text matter covers 2209 pages, the index to trade classifications alone extending over 151 pages, and including over 50,000 trade references. The list of trade names, brands, titles of identification, etc., numbering 1212 pages, furnishes ready reference to distinctive products manufactured by concerns listed in the work. An alphabetical section containing in one a list of the name, trade, description and address of every concern appearing in the book is published for the first time in this edition.

Mexican Industry Revives

Great Demand for Iron and Steel Develops as Confidence Returns —Heavy Duties Are Imposed on Imports

Monterey, Mexico, Dec. 20.—An extraordinary demand for iron and steel products now exists throughout Mexico. The Monterey Steel & Iron Co., the stock of which is owned largely by Italians, now has nearly all of its departments in full operation and is turning out large quantities of structural steel, steel billets and other products that must enter into the rehabilitation of the industries of this country. The plant of this company was constructed at an original cost of $10,000,000 gold. Later on it added a department for rolling steel rails and for the manufacture of other kinds of steel products. It is now not only supplying iron and steel for construction work in Mexico, but regular shipments of steel billets are being made to the United States. These go chiefly to Texas cities and towns, particularly San Antonio, Houston, El Paso and Dallas. For several months the company has been filling large orders from Italy for steel billets. The iron ore mines in the State of Nuevo Leon have been reopened. High-grade iron ore is also being received intermittently from the Iron Mountain at Durango.

Steel for the construction of oil tanks will soon be manufactured on a large scale in Mexico. It is announced that plans for the building of an iron and steel plant at Tampico are well under way and that Americans are back of the proposed industry. Several of the larger oil operating companies in that territory have adopted the reinforced concrete type of oil storage tanks and a number of these are now being built.

Heavy Duties Are Imposed

In order to still further encourage the development of the iron and steel industry in this country, the Mexican government has just issued a decree imposing heavy duties on all iron and steel imported into the country. This duty is applied not only to pig iron, but to all kinds of manufactured iron and steel products, including mining and agricultural machinery and implements, the only exceptions being tractors, automobiles and other motor vehicles. The exemption from duty upon tractors, automobiles and other motor vehicles has been extended until June 30, 1918. Under the new decree the duty runs as high as $2 American money per 100 kilograms on certain kinds of machinery and manufactured iron and steel products. In other cases the duty is as low as 5 cents gold per kilogram. It is expected that these heavy duties will cause a big falling-off in iron and steel purchases in the United States. Mining machinery has been coming into the country at a heavy rate during the last two or three months. Importations of this character for the month of November from the United States amounted to more than 100 carloads.

In the pre-revolutionary days there were enormous quantities of coke manufactured in Mexico, the industry having attained much importance, due to the fact that the demand for that fuel by the smelters and other manufacturing plants here had become very large. At the time of the outbreak of the revolution that was inaugurated by the late Francisco I. Madero Jr., other members of the Madero family had en route to this country fire brick and fire tile to be used in the construction of coke ovens at their coal mines near Esperanza, state of Coahuila, the value of these construction materials being more than $400,000. Owing to the possibility of the material being destroyed upon reaching this country by the opposing political faction, the big shipment was held up at Eagle Pass on the Texas side of the border, where it is still stored in bond.

Importing Much American Coke

Notwithstanding the large production of coke in Mexico, the demand is so great for this fuel that large quantities, of it are imported from the United States, and, previous to the war, much of it came from Wales. It is announced by the government authorities that since the reopening of the coal mines in the state of Coahuila, the manufacture of coke has been resumed and that the output promises to reach a normal stage within a short time.

Another industry in Mexico that has been revived recently is that of manufacturing cement. The large cement plant at Hidalgo near the City of Mexico which was owned by the British interests has been taken over by the government, it is stated, and preparations are being made to resume operations. The cement plant at Monterey also will be placed in operation.

Several of the larger lumber mills of the country have again been placed in commission and cross-ties for the reconstruction of long stretches of railroads are now being obtained chiefly from this source. Considerable lumber, however, is being imported from the United States. Contracts have been let for the construction of many new railroad bridges and several of the larger stations that were burned by the revolutionists, now are being rebuilt.

Detroit Gets Shell Plant

Detroit, Dec. 22.—Backed by subscriptions from several large motor car and parts manufacturing companies, the Detroit Shell Co. was organized in the automobile city on Dec. 14, with $2,000,000 capital stock.

The company, of which John Kelsey, of the Kelsey Wheel Co., is president, has taken an initial contract for the manufacture of $30,000,000 worth of shells of various sizes. Other officers of the company have not been announced.

It required but 18 hours to complete the organization of the company. Maj. C. C. Jamieson, of the ordnance department, Washington, arrived in Detroit Thursday noon and offered an initial contract of $30,000,000. By 6 o'clock the company was assured and at noon Friday the authorized capital of $2,000,000 was subscribed and officers named.

John Kelsey, president of the new company states that between 8000 and 10,000 men will be employed. J. Walter Drake, president of the Hupp Motor Car Co., also is interested in the new company. It is understood that subscriptions for from $50,000 to $100,000 were entered by the Timken-Detroit Axle Co., Studebaker Corporation, Kelsey Wheel Co., Paige-Detroit Motor Car Co., Maxwell Motor Co., Hupp Motor Car Co. and others

The new plant will manufacture shell cases and it is said it will be the largest of its type in the country. It gives Detroit pre-eminence in munitions production among the large cities of the country, adding as it does to the products of the Lincoln Motor Co., Ford Motor Co., Packard Motor Car Co,. Dodge Brothers and other concerns now engaged in munitions work.

Incorporated with a capital stock of $75,000, the Hoffman-Perry Iron & Steel Co., Youngstown, will engage in a general scrap iron business. The company has taken over the property of the Fred Hoffman's Sons Lumber Co. The officers are: Frank W. Perry, president; M. J. Sussman, vice president, and Louis Hoffman, secretary-treasurer. These with Joseph Hoffman and G. F. Hammond are the incorporators.

Men of the Iron Trade

Personal News of a Business Character Regarding the Men of Affairs of the Industry

ROBERT F. HERRICK, president of the Reed-Prentice Co., Worcester, Mass., has been appointed a member of the Massachusetts committee on war efficiency. Mr. Herrick is possibly identified with more New England industries than any other man. The committee will practically assume control of the labor situation as well as other factors entering into industrial conditions pertaining to the war in Massachusetts.

Harry W. Ford has resigned as president, but will continue as director of the Saxon Motor Car Corp., Detroit.

Allan C. Chambers has been appointed assistant sales manager of the Russell Motor Axle Co., Detroit, manufacturer of internal gear drive axles for motor trucks.

David Heinselman, a former member of the state legislature from Mahoning county, has accepted a position in the traffic department of the Brier Hill Steel Co., Youngstown, O.

E. A. Hawks has been appointed Detroit representative of the Youngstown Steel Car Co., Youngstown, O., with offices in the Dime Bank building.

Philip W. Frieder, manager of Joseph, Joseph & Bros., Youngstown, O., has taken up his duties at Washington as purchaser of heavy melting steel for the government.

Julius J. LaBonte, with his re-election as general manager and secretary-treasurer of the Leitelt Iron Works, Grand Rapids, Mich., begins his seventh year as head of that plant.

George Naphen, Worcester, Mass., who organized the Connecticut Brass & Mfg. Co., Waterbury, Conn., is to be a member of the firm of Liggett & Drexel, New York bankers, after Jan. 1.

A. L. Flint, chief clerk of the purchasing department of the Panama canal, has been made general purchasing officer, succeeding Major Benedict Crowell, now assistant secretary of war.

Robert Snedden Jr., who for several years was in charge of the docks of the By-Product Coke Corp., at South Chicago, has been appointed master mechanic of the Buffalo plant of the Semet-Solvay Co.

F. J. McGrail, formerly superintendent of the foundry operated by the Struthers-Wells Co., Warren, Pa., resigned to become affiliated with the pattern lumber force of Smith, Fassett & Co., wholesale lumber merchants, North Tonawanda, N. Y.

F. D. Chase, Peoples Gas building, Chicago, industrial engineer, will address the Philadelphia Foundrymen's association, Jan. 3, on "Efficient Foundries for Modern Foundrymen". The meeting will be held at the Manufacturers' club, Philadelphia.

H. P. Rodgers, recently resigned as assistant steam engineer for the American Steel & Wire Co., Cleveland, with which he has been affiliated for eight years, to become manager of sales for the Steam Equipment Mfg. Co., with offices at Cleveland.

Clarence H. Beach, formerly affiliated with the sales force of the Midvale Steel Co., and more recently as sales engineer for the Midvale Steel & Ordnance Co., has resigned and will be district sales manager for the Central Steel Co., with offices in Chicago.

William Judson Kibby, formerly personal specialist of Cleveland, has been appointed director of personal development for C. E. Knoeppel & Co., counsel on personnel, organization and management, 101 Park avenue, New York.

E. F. Lake, metallurgical engineer of Detroit, has accepted the position of assistant superintendent of the Rich Tool Co., 557 East Fiftieth place, Chicago, manufacturer of one-piece valves from high-speed steel for airplane and automobile engines.

John E. Liggett, upon his recent resignation as president of the Connecticut Brass & Mfg. Corp., Boston, was made chairman of the board of directors. Harry W. Goddard, formerly vice president, succeeds him in the presidency.

Major George S. Weiberg, Russian representative of the National Lead Co., the Worthington Pump & Machinery Co., the Cleveland Twist Drill Co., and other interests, has been ordered to active duty with the Thirtieth Engineers at Camp American University, District of Columbia.

W. D. Berry, who for over six years has been general superintendent of the New Brighton, Pa., plant of the Keystone Bronze Co., Pittsburgh, has resigned and after Jan. 1 will commence the manufacture of brass, bronze and copper castings in a suitable location in the Beaver valley.

Samuel A. Benner, vice president of the Federal Export Corp., 115 Broadway, New York, sailed recently for Buenos Aires, Argentina, in the interests of his company. Mr. Benner will also supervise the extension of the Federal Export branch house system in the territory he will visit.

H. G. Gable, recent general sales agent, the American Iron & Steel Mfg. Co., Lebanon, Pa., with H. T. Gerdes, of M. Gerdes & Co., consulting engineers, has organized the Atlantic Iron & Steel Corp., New York, to buy and sell iron and steel products.

Walter F. Alexander, formerly superintendent of engineers at the Harlan & Hollingsworth plant of the Bethlehem Steel Co., Wilmington, Del., has resigned. A farewell dinner was given him by the superintendents, foremen and assistant foremen of that plant.

Andrew T. Hines, formerly purchasing agent of the General Vehicle Co., Long Island City, and the Steel Pro-Producers Export Co., New York, has been made manager of the New York office of the Carroll Steel Co., which has moved into larger quarters, 15 Park Row. Its former address was 120 Broadway.

Walter E. Flanders, president of the Maxwell Motor Co., Detroit, has been appointed chairman of the board of directors, to be relieved of details arising through the company's lease of the Chalmers Motor plant. W. Ledyard Mitchell, of Cincinnati, has been elected president to take office Jan. 1.

John A. Fouse has been placed in charge of the Pittsburgh branch office

Men of the Iron Trade

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of the American International Shipbuilding Corp., located in the Union Arcade building, and he will keep in touch with contracts that have been placed with mills in the Pittsburgh district and mills further west for ship steel.

Walter C. Voss has surrendered his position in charge of the Detroit office of the rim and tube division of the Standard Parts Co., Cleveland, to A. A. Loeffler, formerly of the Jackson-Church-Wilcox Co., Saginaw, Mich. Mr. Voss will locate in Washington to look after his company's business in that territory.

Harry W. Goddard, president and treasurer of the Spencer Wire Co., Worcester, Mass., has been elected president of the Connecticut Brass & Mfg. Co., Waterbury, Conn., to succeed John E. Liggett, of Liggett & Drexel, New York, resigned to become chairman of the board of directors.

N. B. Payne has established an office in the Havermeyer building, 25 Church street, New York, and will specialize in supplying to the trade new and used traveling cranes. Mr. Payne formerly was associated with Manning, Maxwell & Moore, Inc., New York, and has had a wide experience in this line of work.

Frederick Nettleton, after an affiliation extending over a period of 16 years, with the Waterbury Clock Co., Waterbury, Conn., first as paymaster, then as assistant superintendent and for the past eight years superintendent, has resigned to accept a responsible position with the Bristol Brass Co., Bristol, Conn., Jan. 1.

J. R. Shays Jr., has been placed in charge of the New York branch of the Abell-Howe Co., Chicago, located at 30 Church street. C. W. Wheeler and Wayne Paulin now manage this company's new branch office at 5086 Jenkins arcade, Pittsburgh, and H. G. Bates has been placed in charge of the Detroit branch at 803 Ford building.

Gen. Edmund Hayes, Buffalo, widely known as an engineer and builder of the cantilever bridge across the gorge at Niagara Falls, has been elected a life member of the corporation of the Massachusetts Institute of Technology, Cambridge, Mass. He was a student of the class of 1873 and has been engaged in engineering projects in all parts of the world.

H. E. Miles, Racine, Wis., chairman of the committee on industrial training of the national defense council, and Sidney W. Ashe, Pittsfield, Mass., chairman of the New England section of this committee, were the speakers at the monthly dinner and meeting of the Boston branch, National Metal Trades association, at Parker House, Dec. 17.

J. E. Buckingham, who at present is representative of the Standard Steel Works Co., Philadelphia, with headquarters in the Northwestern bank building, Portland, Ore., will on Jan. 1 take up his duties as assistant general manager of the Hofius Steel & Equipment Co., with offices in the L. C. Smith building and shops at First avenue South and Spokane street, Seattle.

Russell R. Clarke, formerly affiliated with the Pennsylvania Co., Pittsburgh, and subsequently with the Johnson Bronze Co., Newcastle, Pa., has accepted the position of superintendent of the Eagle Brass Foundry, 21 Spokane street, Seattle, Wash. Mr. Clarke is well known as a writer on foundry subjects. He has acquired an interest in the Eagle Brass Foundry which now is housed in a modern foundry building.

W. Starling Burgess, yacht designer and head of the Burgess Co., maker of airplanes, Marblehead, Mass., has been granted leave of absence for the duration of the war. As lieutenant commander in the government service, he will have charge of a branch of nautical construction in the navy department.

William Butterworth, Moline, Ill., was elected president of the Illinois Manufacturers' association, Chicago, at its annual meeting Dec. 12. Other officers follow: Dorr E. Felt, first vice president; William Nelson Pelouze, second vice president, and Peter S. Theurer, treasurer. The new directors are Samuel M. Hastings, Charles Piez, Alfred H. Mulliken, G. R. Meyercord, Paul Schulze and Fred W. Upham.

W. H. Harman, vice president and general sales manager of the Southwark Foundry & Machine Co., Philadelphia, has been elected president of that company to fill the vacancy caused by the election of Robert Radford to the chairmanship of the board of directors.

Canada Has Big Electric Furnace Capacity

At the ninth annual meeting of the commission of conservation at Ottawa, Sir Clifford Sifton, chairman, announced that an interesting investigation had been made under the department regarding the development of the electric smelting problem. He stated that at the present time there are in Canada 32 heroult electric furnaces and 22 of other types, in all 54 furnaces employing the electric process. These furnaces have a capacity of 173,000 tons of iron and steel, 50,000 tons of ferrosilicon, and 8000 tons of other ferroalloys per year. The British Forgings plant at Toronto includes 10 electric furnaces of the heroult type, with a total yearly capacity of about 72,000 tons, which makes it one of the largest electric furnace plants in the world.

Flinn Elected President

At a meeting of the Engineering Council held recently in the Engineering Societies building, New York, Alfred D. Flinn was elected permanent secretary, succeeding Calvert Townley, who has held the office since organization. The Council, which is composed of representatives from the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers and the American Institute of Electrical Engineers, adopted resolutions requesting the administration of the National Selective Service Draft law in such a manner as to allow engineering students to continue their studies until graduation.

The Inland Steel Co. is having plans prepared by A. S. Alschuler, Chicago, for a hospital building

Solve Labor Problem by Housing

Many Employers Giving Intensive Study to Furnishing Their Men With Comfortable Living Conditions—Finding Outlay is Justified by the Big Reduction in Total Labor Turnover—War Increases Problem

AN IMPORTANT problem confronting large employers of labor is that of housing and the extent to which it is receiving consideration and is being solved, forms one of the interesting developments of industrial conditions brought about by the war.

In the selective service camps, although crowded in some few instances, the problem has been met by the building of ample barracks and perhaps some such modified form of accommodation will be necessary in the cases of large industrial establishments where thousands of men are employed and trained. What has militated against extensive building of homes, dormitories, or other living quarters for employes, is the high cost of building material, etc. It is felt, however, in many directions that cost is more than offset by the reduction in the percentage of labor turnover, when housing conditions are satisfactory.

Leslie H. Allen of the Aberthaw Construction Co., Boston, Mass., in a paper entitled "Industrial Housing Problems", states that one manufacturing concern in Bucyrus, O., brought 150 employes to that city at great effort. After a few days, 30 remained, the other 120 left having failed to secure comfortable homes. Six cement companies recently analyzed their labor turnover for a period of three years and discovered that it averaged 103 per cent per annum. A public service corporation recently confessed to a labor turnover of 1100 per cent and while that is exceptional, an annual turnover of 400 per cent is not uncommon.

Looking into the Future

Employers perhaps have been too much concerned with the mounting construction cost and have not given sufficient attention to what might be termed "labor turnover" cost, but a large number of companies in different sections of the country are looking into the future, realizing that sooner or later suitable dwellings will have to be built if they are to retain their trained labor.

The Youngstown Sheet & Tube Co. has under way the project of building concrete dwellings sufficient for 246 families at East Youngstown, O. Parts for these houses are first poured in forms and are later assembled. Work has been commenced upon the sixty-sixth house, and it is hoped that spring will find these accommodations completed. The Liberty Steel Co., Warren, O., is building two-story houses for its employes, while the Eastern Steel Co., Pottstown, Pa., is erecting bungalows. The Midvale Steel & Ordnance Co. has completed a large number of houses and a hotel to be occupied by employes of its Worth Bros. Co. plant at Coatesville, Pa. The Steel Equipment Co., which recently put up a large plant at Avenal, N. J., already has completed a large number of houses and is building more. The Scovill Mfg. Co., Waterbury, Conn., is planning to start work immediately on dormitories to accommodate 500 people.

Shipyards Erect Dwellings

Activity in housing is extending in the shipbuilding industry. The Manhattan Shipbuilding Corp. is planning to build 1000 dwellings at Newburgh, N. Y., for its employes; the Downey Shipbuilding Co., will start construction at once on 300 two-story workmen's homes of brick, concrete and stucco at Arlington, Staten Island, N. Y.; the American International Shipbuilding Corp., which will employ 30,000 men at its Hog Island, Philadelphia plant, has started construction on homes for this army of workmen, and the American Shipbuilding Co. is building a large number of homes for some of its 1000 workmen at Bristol, Pa., for whom the normal accommodations are insufficient, while it is planned to use the small seashore hotels in New Jersey to accommodate the employes of the New York Shipbuilding Corp.'s Camden, N. J., plant.

That the government has not escaped this problem is evidenced by the report that congress will be called upon for a large appropriation with which to build apartment houses in Washington to house the army of federal employes now located there.

A recent government survey in England showed that 150,000 new houses are needed immediately and 180,000 will be needed after the war. Plans are now under way for the construction of 40,000, while authorities are willing to build 116,000. Housing requirements of munitions workers has stimulated state interest in the proposition.

Employment After the War

It is the intention of the committee appointed by the employes relations department of the Norton Co., Worcester, Mass., to provide employment for its 365 employes when they return from the service of the United States government in the war. This applies particularly to those who are crippled or disabled. A thorough shop analysis in each department has been commenced and when this is completed a list will be made of the jobs which can be performed by disabled men. As soon as they are available the placing of such men will begin. What is true of the plant of the Norton Co. is true of other Worcester plants. Employment already has been given to many cripples at the plant of the Worcester Pressed Steel Co., and announcement is made that a place will be left open in every Worcester shop for any employe disabled in the present conflict.

Intensive Training for Women

Manufacturers of ordnance, trade school representatives and the New England committee on industrial training for war emergency, held a conference in Boston, Dec. 18, to formulate plans to speed up munitions making by educating women to do the work of men. Representatives of the trade schools volunteered to work out courses of intensive training for women, particularly for the benefit of the smaller manufacturers, since the larger plants have schools of their own.

S. W. Ashe, Pittsfield, Mass., chairman of the New England industrial training committee, who presided at this meeting, gave two instances, illustrative of the problems ahead. "Two large companies," he said, "each employing 14,000 in the manufacture of small arms and shell cases, must increase their forces by 5000 each before April 1. As the war proceeds," he continued, "the demands for ordnance work will increase and will require many additional workers. Nonessential industries will release much untrained labor and this must

be instructed so that schools must be found where intensive training can be given for a few weeks. In one large fuse-making plant in the west, women are found to be accurate, have fewer accidents proportionately than men and while they have not as much physical strength or endurance, they do their work satisfactorily under male supervision.

Employes Receive Bonus

For eight years the Cleveland Crane & Engineering Co., Wickliffe, O., has distributed a share of its yearly profits to its employes for faithful service, and this year fully 50 per cent of the employes received checks. Bonuses are figured upon a percentage basis, 3000 hours being taken as a year's work. Each employe who has not been absent from work more than one day each month during the year receives 2 per cent of his annual wages for each full year he has been employed, so that a man who has worked continuously for eight years receives 16 per cent of his year's wages. Many of the older employes this year received 20 per cent. It is claimed that the mutual benefits of this plan are inestimable.

Pays Million Bonus

A bonus of $1,000,000 was distributed by the Crane Co., Chicago, to its 12,000 employes at Christmas. Each one of 7000 at Chicago, 3000 at Bridgeport, Conn., and 2000 at various other branch offices of the company received 10 per cent of his annual earnings as a Christmas present. On Dec. 1 each employe received a 10 per cent increase in wages which was the second increase in a month. On Jan. 1 a system of death benefits will be inaugurated. Upon the death of an employe who has been one year in the company's service, $500 is paid to the family and that amount is increased by $100 for each additional year of service rendered until $1000 is reached. This announcement was made recently.

Obituaries

CAPTAIN THOMAS WILLIAM FITCH JR., United States Reserves, aged 39 years, president of the Columbia Steel & Shafting Co., Carnegie, Pa., died Dec. 21 at Post Graduate hospital, New York, following an operation for chronic ulcerated stomach. He had gone to the hospital the preceding Wednesday.

Captain Fitch was a grandson of William Tecumseh Sherman of civil war fame, and a son of the late Lieut. Thomas William Fitch, who retired in 1913 as president of the company when he was succeeded by his son. The last year of the life of Captain Fitch was devoted to army work and during that period he was promoted rapidly. He was selected to fill important posts in camps in the training of officers and draftees. He won a captain's commission at the Pittsburgh officers' training camp in November, 1916, and in May of the present year was assigned to Fort Oglethorpe, Ga., as an instructor in the officers' training camp there. In August he was ordered to Camp Jackson, Columbia, S. C., to train draftees. At the latter camp he acted as adjutant.

Captain Fitch was born on June 24, 1878, in Lancaster, O. His father served in the civil war; and his mother, Minnie Sherman Fitch, was a daughter of General Sherman. Captain Fitch came to Pittsburgh in his early youth. Upon the retirement of his father as president of the Columbia Steel & Shafting Co., Captain Fitch took up the duties of that office. His father died April 8, 1915. Captain Fitch was also vice president of the Merchants Savings & Trust Co., and a member of the University and Duquesne clubs of Pittsburgh and of the Army and Navy club of New York. He was educated in the Shadyside academy, Pittsburgh, and in Holy Cross, Boston.

Joseph H. Woodward, age 74, president of the Woodward Iron Co., with many other important business connections in Birmingham, Ala., died at his late residence, Dec. 15, after a lingering illness covering a period of over two years. He was born at Pittsburgh, and his father, who in 1853 founded the La Belle Iron Works of Wheeling, W. Va., purchased large holdings of Alabama land in 1869 and six years later sent his son, the late Joseph H. Woodward, down to look over the properties and report upon them. Because he did not think the time ripe for their development he returned to Wheeling and became recretary of the La Belle plant. Between 1878 and 1880 he located in Taylor, Tex., buying a cattle ranch, but returned to Wheeling where the Woodward Iron Co. of Alabama was organized in 1881. His elder brother, the late H. W. Woodward, was president and Joseph H. was secretary. In 1882 the brothers commenced building the Woodward, Ala., plant and in the summer of 1883 their first furnace went into place. In 1886, H. W. Woodward severed his connection with the company and Joseph H. became president, which office he held until his death. A son, A. H. Woodward, now is chairman of the executive board of the Woodward Iron Co.

Joseph Morgan Jr., born July 27, home, Johnstown, Pa., of heart failure. First a draftsman for the Cambria Iron Co., he was promoted to the position of chief engineer in 1881 and on Nov. 1, 1906, he was made consulting engineer of the Cambria Steel Co. In that capacity he had charge of the building of the Quemahoning dam in 1913 and the Saltlick dam several months later. He severed his connection with the Cambria company when his health commenced to fail three years ago. Mr. Morgan had about 50 years professional experience in engineering and was familiar with the art of steelmaking, its progress and history from the date of the inception of the bessemer process to the present time. He was a director of the Citizens' Light, Heat & Power Co., the Johnstown Water Co. and at the time of his death was interested in the Consumers' Gas Co., Johnstown. He was a member of several associations and belonged to numerous societies. His widow survives with two sons, a daughter, three grandsons and a granddaughter.

Peter McAnally, who died recently of pneumonia at Germantown, Pa., was born in Ireland in 1845. He was an expert in the steel business and at the time of his death was superintendent of the crucible plant of the Midvale Steel Co., with which company he was affiliated for 50 years. He is survived by three daugters and a son.

Charles R. McCabe, private secretary to John D. Ryan, president of the Anaconda Copper Mining Co., died Dec. 20 at his home in Montclair, N. J.

Iron and Steel Financial News

Up-to-the-Minute Fact and Comment Collected and Sifted For Busy Readers

Makes Important Rulings in War Tax

SEVERAL important regulations pertaining to the administration of the excess profits section of the war revenue act have been issued by the commissioner of internal revenue, with the approval of the secretary of treasury. The rulings were issued upon the recommendation of the excess profits committee which was recently organized by Secretary McAdoo.

One of the regulations authorizes a partnership, in computing its net income for the purpose of the excess profits tax, to deduct as a business expense reasonable salaries or compensation paid to individual partners for personal services actually rendered. It also authorizes an individual engaged in a trade or business to designate a reasonable amount as salary or compensation for personal services actually rendered by him in the conduct of such trade or business. In the case of both the partnership and the individual, such salaries or compensation cannot exceed the salaries or compensation customarily paid for similar services under like responsibilities by corporations engaged in similar lines of business. Such salaries or compensation received by partners or designated by individuals are, however, subject to taxation to them at the 8 per cent rate under section 209 of the excess profits tax law. This regulation is expected to equalize taxes of partnerships and individuals with those of corporations, placing all business on a similar footing.

Partners' Share Dividends

Two other regulations also relate to partnerships. One holds that in computing net income for the purposes of the excess profits tax a partnership will also be allowed to deduct amounts paid during the year to an individual partner as interest upon any bona fide loan made by him in his individual capacity, but no deduction for any interest upon capital will be recognized. The other holds that a partner in his individual capacity will not be considered as engaged in trade or business with respect to his share in the profits of the partnership and consequently he will not be subject to excess profits tax thereon. The effect of this ruling is to treat a partner's share in profits in the same way as dividends from a corporation. In other words, A, B and C may be partners in a business returning an annual net income of $100,000. Ordinarily they might divide this income between them. But under the war revenue act they will pay themselves salaries of, say, $15,000 each. On this $15,000 each will be subject to an excess profits tax of 8 per cent, after a deduction of $6000. The combined salaries amount to $45,000, leaving net taxable income of the partnership amounting to $55,000. If the government levies an excess profits tax amounting to $20,000 on this amount, the partners will have left $35,000 to divide among themselves, which will not be subject to further excess profits taxes, but will be subject to the normal and war income taxes.

Another regulation provides that for the purposes of the excess profits tax a return of information with respect to the capital and income of the prewar period will not be necessary, in case the taxpayer either accepts the minimum percentage of 7 per cent as the percentage to be used in computing the deduction under section 203, or in case the trade or business is taxable only at the 8 per cent rate, as when the capital employed is only nominal. This regulation will obviate in such cases the compilation of a large volume of data which is not absolutely necessary for the proper computation of the tax.

Still another regulation holds that the term "intangible property" as used in the definition "invested capital" will be construed so as to mean only property of a character similar to trade marks, good will, and other kinds specifically enumerated in section 207 of the law. Stocks, bonds, bills and accounts receivable and other evidences of indebtedness are held to be taxable property within the meaning of this law. This regulation is the first pertaining to the important question of invested capital, without a definition of which many business concerns cannot proceed to compute their taxes. Other regulations bearing upon this question will be issued as soon as possible, the commissioner says.

Two other rulings have been issued which are of importance to business concerns. One authorizes inventories of supplies, raw materials, work in process of production and unsold merchandise to be taken either at cost or at market price, whichever is lower. However, the method adopted must be adhered to in future years, unless a change is authorized by the commissioner of internal revenue. The other ruling provides that in any case in which the deduction provided for in the excess profits tax law is greater than 15 per cent of the invested capital and therefore cannot be fully allowed under the first rate of that law, any remaining proportion of the deduction will be allowed under the second or succeeding rates until the entire amount of the deduction has been allowed. This construction of the law is deemed to be fully in accordance with its spirit and purpose, as it allows the taxpayer the full benefit of the deduction in all cases, as was the evident intention of congress. This is a sensible interpretation of a provision which, if carried out literally, would have worked hardship on a great many small business concerns. The commissioner has prepared illustrations to indicate the application of this provision, which are here reproduced:

An individual or partnership engaged in the manufacturing business with a capital of $30,000 and a net income of $12,000 for the taxable year, an average pre-war net income of 9 per cent, or $2700, and a total deduction of $8700:

Bracket	Rate, per cent	Amount taxable und. each bracket	Tax
First	20	....	....
Second	25	....	....
Third	35	....	....
Fourth	45	$1200	$540
Fifth	60	2100	1260
Total	..	....	$1800

A corporation engaged in the manufacturing

business with a capital of $30,000 and a net income of $12,000 for the taxable year, an average pre-war net income of 9 per cent, or $2700, and a total deduction of $5700.

Bracket	Rate, per cent	Amount taxable und. each bracket	Tax
First	20	....	....
Second	25	$300	$75
Third	35	1500	525
Fourth	45	2400	1080
Fifth	60	2100	1260
Total	..	....	$2940

Suggest Revision of Tax on Excess Profits

Efforts to have the excess profits clause of the tax revised continue to be made and various protests against what are termed its unfair features are being filed with Secretary of the Treasury McAdoo. When the secretary of the treasury, realizing the difficulties attendant upon the administration of this law, decided to appoint an advisory committee to assist in framing regulations, the American Mining Congress, through its secretary, J. F. Callbreath, wrote him and urged the selection of a representative of the mining industry to serve upon such a board. Referring to the difficulties of ascertaining war and prewar profits, the mining congress stated: "The mining business deals with an exhaustable product, which once exhausted can never be replaced. Its income cannot in fairness be calculated upon the same basis as the income of other lines of business which reproduce themselves." Because the letter arrived too late, it failed in its purpose and several changes were then submitted and in the form of a brief presented to the advisory board.

The latest suggestion of revision finds its source in Cleveland. Christian Girl, president of the Standard Parts Co., and chairman of the military motor truck section of the council of national defense, stated recently that the excess profit tax law, as it stands now, is equivalent to standing a pyramid on its apex rather that on its base and handicaps production because it puts a penalty on increasing profits. He suggested that both labor and the direction of it be relieved of penalties and be placed on a premium basis by lowering the rates of taxation as production increases, giving as his conviction that this would increase revenue. An extract from Mr. Girl's statement follows: "I submit for consideration a change in the excess profit tax plan, substituting the following for the percentages mentioned under rate of tax: Thirty-five per cent on difference between 9 per cent and 15 per cent; a less per cent on difference between 15 and 20 per cent, etc., the graded percentages mentioned to be arranged for by statisticians." It is also recommended that 40 per cent of all profits above government taxes be distributed to stockholders of corporations in cash dividends or government securities and that a definite percentage of profits above government taxes be distributed to the employes. Of these amounts the government should collect 10 per cent as taxes on special income from corporations.

Bethlehem Steel Again is Sued on Stock Plan

The Bethlehem Steel Corp. again has been made the defendant of a suit in the New York supreme court with regard to its new capitalization plans. The General Investment Co., which recently failed to obtain a court order for an inquiry into the alleged bonuses paid Charles M. Schwab, chairman of the corporation's board of directors, and other officials, wishes the court to declare the company's new issues of $30,000,000 preferred and $30,000,000 common stock invalid. It is charged that these new stock issues contravene the laws of the state of New Jersey, in which the company was incorporated. The co-defendants named with the Bethlehem company and Mr. Schwab are: The Equitable, Guarantee and Bankers' Trust companies; J. & W. Seligman, Alan A. Ryan, George R. Sheldan and other prominent financiers and directors of the company. Charges are made that some of the defendants have caused the steel company large losses and the investment company demands that these be made good. It also seeks an accounting from the directors and members of the underwriting syndicate that floated the stock issue.

Takes Over Wire Plant

The Wire Goods Co., Worcester, Mass., has recently taken over the Andrews Wire & Iron Works, Rockford, Ill., making three corporations which it controls, the Cassady-Fairbank Mfg. Co., Chicago, and the Andrews Wire Works, Ltd., Watford, Can. Reginald Washburn, president and treasurer of the Wire Goods Co., has been elected president of the Rockford company. The announcement of the deal was made by Mr. Washburn at the annual sales conference of the four companies in Worcester last week, which was attended by 30 salesmen.

Benzol Contracts

Are Renewed at Previously Prevailing Figures—Toluol is Wanted

New York, Dec. 22.—Several additional large benzol contracts were renewed this week, around the prices prevailing last week and the market continues to be quoted at 39 to 41 cents per gallon at producer's plant. Outside of two or three fairly large lots which went at these prices, the spot market was quiet. Several consumers of toluol for commercial purposes have made urgent efforts to obtain lots, but so far none has been released. Permits for such sales have been made in some instances, by one of the departments of the government, only to have the shipment held up by another department. Therefore, the few permits of this character which so far have been granted are held in abeyance.

Large sales of crude naphtha have been made during the week. As a result, the supply of refined solvent naphtha promises to be rather low for an indefinite period. Practically the only sales of solvent naphtha this week were all small quantities which are to be mixed with benzol to keep the latter from freezing. Unsuccessful efforts to obtain phenol, due to the scarcity of this product, have led to a let-up in demand. There is no contracting owing to the extent to which producers are sold ahead and the amount of spot business is very limited. The spot market may be quoted nominally at 53 to 54 cents per pound at producer's plant. Sulphate of ammonia continues quiet at $4.90 to $5 per 100 pounds at seaboard, which figure, due to the lack of business is practically nominal.

Coke Oven By-Products

Spot

Per Gallon at Producers Plant	
Pure benzol	$0.39 to .41
Toluol (nominal)	1.70 to 1.80
Solvent naphtha	.19 to .22
Per Pound at Producers Plant	
Phenol	$0.52
Per 100 Pounds at Seaboard	
Sulphate of ammonia	$4.90 to 5.00

Contract

Per Gallon at Producers Plant	
Pure benzol	$0.39 to .41
Toluol	nominal
Solvent naphtha	.19 to .22
Per Pound at Producers Plant	
Phenol (nominal)	$0.52
Per 100 Pounds at Seaboard	
Sulphate of ammonia	nominal

The business of the Collins Iron Works, Phelps, N. Y., has been sold to the Ferro Engineering Corp.

Navy Purchasing Methods Adequate

Department's Purchasing System is Meeting War's Requirements in a Thoroughly Creditable Manner According to Rear Admiral Samuel McGowan—Federal Trade Commission Still Urges Contract Abrogation

WASHINGTON, Dec. 24.—The navy department's purchasing system has been found equal to meeting unusual conditions as a result of the war, according to a report recently prepared by Rear Admiral Samuel McGowan, paymaster general of the navy and chief of the bureau of supplies and accounts. The report deals with the value of publicity in obtaining supplies and elimination of middlemen in bidding. It says in part:

"The fact that all purchases of naval supplies, with the exception of three items of ordnance, are centralized in one office has made it possible for the navy to secure adequate supplies to meet all its needs at the most advantageous prices, and all in strict accordance with legal requirements—and this without criticism from within or without the service.

"It has been found unnecessary to throw any veil of secrecy around the navy's business, whereas out and out publicity insures in advance a square deal for each bidder whether present or absent. The importance of purchasing supplies for the navy from only those who actually have the goods and who alone are in a position to sell them cannot be too frequently stated or too strongly emphasized.

"How to secure the widest competition and at the same time get prompt delivery must always be a question difficult to answer. Before any firm's name is now placed upon the bidding list or before a bid is considered, inquiry is made as to the status of such firm to determine whether or not it will become a satisfactory source of supply and thus promote the navy's efficiency.

"The navy has adopted the policy of direct bidding, which automatically solves the problem which has confronted its purchasing department for many years. The task of making navy business attractive to original sources of supply has required the elimination of all unnecessary hindrances to bidding, the adoption of specifications in conformity with commercial manufacture, the use by the navy of conditions of purchase acceptable to the trade and the application of sound business sense to the interpretation of all naval contracts. Wider publicity than ever before is being given to naval purchases. More than 10,000 firms in all sections of the country are now on the navy's bidding list and are kept in constant touch with all important purchases. Bidding forms are sent to each so that purchases are brought to the attention of producers through the navy's direct invitation to them.

"In order to meet the many developments in the price policy, various methods were employed from time to time, but finally the plan was adopted of placing navy orders with producers, making it obligatory upon them to deliver certain supplies, assuring them at the same time, of a reasonable profit, providing preliminary payments at a sufficient rate to meet at least the cost of production and leaving the final price to be determined later. While there are a number of disadvantages in procuring supplies in this manner, it was the only method which could be followed to obtain the materials wanted in the absence of a clearly defined price policy."

Contracts Abrogated

Federal Trade Commission Urges Abrogation in Report

Washington, Dec. 24.—Legislation abrogating bona fide contracts of the iron and steel industry, possibly as an amendment to the Pomerene bill, now in committee before congress, is urged by the federal trade commission in its annual report. The Pomerene bill, which would give the government power to fix steel prices and drastically regulate the industry, is endorsed. The iron and steel trade, with the coal industry, is singled out by the commission for this law making void contracts.

This revolutionary action is asked for "the greatest public advantage" which, the commission seems to think, would be attained by not allowing such contracts to be fulfilled, at least over long periods of time. Authority of the law should be exercised by a temporary administrative body, in the opinion of the commission. Whether this means control temporarily placed with the commission or with a body such as the fuel administration, is not disclosed. No reference is made in the report to the prices fixed by agreement between the government and the steel manufacturers or to the supervision of steel supply exercised by J. Leonard Replogle through co-operation of the American Iron and Steel institute.

Evidence that the commission has gone hastily into this very important matter of contracts is shown in the fact that the report is dated Nov. 15 and that not until Oct. 20 was the commission's questionnaire sent to a few steelmakers for their views and for information on which the commission might base its conclusions. This 25-day period for receipt of answers, compilations, study and opinion is regarded as altogether too brief. It was known publicly as early as Sept. 20 that the commission or at least some of its members favored contract abrogation.

Program is Outlined

Foreign Trade Convention Called for Cincinnati in February

"The Part of Foreign Trade in Winning the War" will be the theme of the fifth annual convention of the National Foreign Trade Council, to be held at the Gibson hotel, Cincinnati, Thursday, Friday and Saturday, Feb. 7, 8 and 9, for which Chairman James A. Farrell has issued the following program:

Thursday, Feb. 7, convention called to order at 10 a. m., by James A. Farrell, chairman; addresses of welcome on behalf of state of Ohio and city of Cincinnati; organization and election of president of convention; topic of session, "Foreign Trade Achievements Up to Date", a series of brief addresses presenting the share of the different elements of foreign trade—shipping, railroads, finance, steel, textiles, chemicals and lumber—in war preparation and work. Thursday afternoon session, 2:30 p. m., topic of session, "After-War Conditions of Foreign Trade", two or three papers discussing measures necessary for American foreign trade to meet the new situation when peace is restored and to hold the gains it has made in recent years—organization in production and co-operation in marketing. The group sessions at 4 p. m. follow: Group 1, "Exports Control and Imports Control", attended by representatives of the war trade board; group 2, "Foreign Credits", in co-operation with the National Association of Credit Men; group 3, "Education for Foreign Trade"; group 4, "The Smaller Manu-

facturer and Merchant" in co-operation with the American Manufacturers' Export association; and group 5, "Getting Into the Game", an experience session for beginners.

Friday, Feb. 8, morning session, 10 a. m., topic, "The Merchant Marine", addresses dealing with the rehabilitation of the American merchant fleet and means to assure its permanent retention; the American foreign trade policy of the future and the problem of the Pacific. The group session for the afternoon will be called to order at 2:30 p. m., and the annual banquet will be held at the Gibson hotel at 7 p. m., Friday.

Saturday, Feb. 9, morning session, 10 a. m., reports of group sessions; reports of general convention committees, miscellaneous business, adjournment.

Vessel Shortage Blocking Chrome Ore Imports

New York, Dec. 22.—Greatly reduced importation of chromite from South Africa and New Caledonia, by reason of the withdrawal of steamships formerly engaged in this trade, has been proceeding steadily for more than a year, with resulting great inconvenience to ferrochrome makers in this country. South African and New Caledonian chrome ore are offered here, on the basis of present freight rates, at around $1.20 per unit at tidewater, for 40 to 50 per cent ore. Scarcity of vessels, however, makes it possible to bring in only an occasional cargo. Efforts continue to be made to develop domestic deposits, but owing to their scattered nature it is difficult to make them yield large tonnages. To such an extent has the domestic output been pushed, however, that production in 1916 is reported by the United States geological survey as 47,035 tons, compared with 3281 tons in 1915, and 591 tons in 1914. Among new deposits which have been opened recently, is one in North Carolina, which at present is yielding about 30 tons of chrome sand a month. This ore, which is marketed by Frank Samuel, Philadelphia, averages 55 per cent in chromic oxide and less than 3 per cent silica, and has been bringing around $90 to $100 per ton, delivered. Owing to its high quality, the latter ore so far has been used principally for chemical purposes. Sales of Canadian ore, containing about 40 per cent chromic oxide, recently have been made to Niagara Falls ferrochrome producers at around $1 per unit, delivered.

Heavy Increase

Shown in Output of Domestic Manganese and Manganiferous Ore

Demands for manganese ore from the steel industry have grown so rapidly in the last year or so that now 600,000 tons represent approximately the annual consumption. That less than one-third of this is furnished by our domestic output is shown by data collected by the United States geological survey. The canvass for the quarter ending Oct. 1, 1917, just completed, shows a large increase in the number of shippers, as well as in the shipments of ore of each grade over those of the first six months of the year, which were slightly in excess of those for 1916. In 1916 only 26,996 tons of manganese ore were shipped by 55 operators, but in the first nine months of 1917, 70,225 tons were shipped by 88 operators. Reports indicate that 1917 shipments will total 122,275 tons, almost four times as much as any previous year's total. About 14,000 tons of high-grade ore were produced in September, while November's output totaled nearly 17,000 tons. As closely as can be estimated, the shipments in 1918 will total between 175,000 and 200,000 tons.

Manganiferous ores with 15 to 40 per cent manganese totaling 380,169 tons were shipped during the first nine months of 1917 by 58 operators against 176,130 tons shipped by 41 operators in 12 months, 1916. Most of this ore was used to make spiegeleisen. Ore containing 5 to 15 per cent manganese, aggregating 424,438 tons, was shipped between Jan. 1 and Sept. 30, 1917, as against 372,673 for the entire year 1916. Noteworthy increases were made by shippers in western states, particularly Montana, Arizona, California, Utah and Nevada.

First Keel is Laid by Submarine Boat Corp.

Because of the inability of Edward N. Hurley, chairman of the United States Shipping board to be present, John Hunter, an inspector for the Emergency Fleet corporation on Dec. 20 drove the first rivet into the first keel to be laid by the Submarine Boat Corp., at its new government shipbuilding plant at Port Newark Terminal, N. J. The vessel thus begun, is the first of fifty 5000-ton fabricated steel craft to be built for the government. It is expected the first ship will be completed by June 1, 1918. Henry R. Sutphen, vice president of the Submarine Boat Corp., who presided at the laying of the keel, said:

"Forty-six plants are turning out the structural steel to be used in these ships, and hundreds of other plants are rushing other parts, all standardized and ready to go into any one of the vessels we will build here."

In addition to the contract for fifty 5000-ton vessels, the Submarine Boat Corp. recently took a second contract for one hundred 7500-ton vessels. Twelve of the 28 ways now are ready for the laying of keels and the others are nearing completion. The administration buildings, storehouses, railroad sidings, power houses and other units of the huge plant have been completed. As the hulls are completed and launched, they will be towed to the docks of the Submarine Boat Corp., half a mile away, where the interiors will be fitted out and the turbines installed.

Organize New Foundry

The Liberty Foundry Co., Milwaukee, has been organized to engage in the manufacture of light gray iron castings. A plant now is being built and the equipment is being purchased. G. W. Mockly, president, for 11 years was treasurer and manager of the Wisconsin Foundry Co., Milwaukee, and Edward G. Mockly, who will be in charge of operations, formerly was superintendent of the Wisconsin Foundry Co. W. J. Buckley, who has been elected secretary and treasurer, occupied the same position for 14 years in the T. L. Smith Co., Milwaukee.

To Treble Torpedo Plant

The government's naval torpedo station, Newport, R. I., is to be enlarged so as to treble its production, plans for which have been approved by the navy department. Extensive slips for warships, a power plant to cost $1,000,000, additions to the machine shops, additional storehouses, big wharves seaward to permit the loading of large ships and sea walls are included in the program of the engineers. It is expected at least 6000 mechanics will be employed at the station within a year. Where there are now 125 women primer makers there will be 1000 when a new building under construction is completed.

The Beckemeyer Foundry Co., Beckemeyer, Mo., has erected a small jobbing gray iron foundry and will specialize in mines cars and wheel work. H. H. Timmerman is secretary and general manager, and E. T. Williams is foundry superintendent.

Quiz May Stimulate Tool Buying

Washington Investigation Many Think Will Intensify Demand for Machine Tools—Rock Island Arsenal to Buy More Equipment—Tool List of Morgan Engineering Co. Still Unfilled

MACHINERY sellers are watching with interest the various investigations now under way at Washington, for they appreciate the extent to which conditions in the machine tool market are responsible for apparent delay in some of the government's war programs. The various government departments are growing more and more urgent in their demands for tools, but the market long since was saturated. It is now principally a matter of placing each tool as it is completed in the place where it is the most needed.

Issues Big Tool List

With the co-operation of the government, the Framerican Industrial Development Co., 44 Whitehall street, New York, agent for the Schneider Works, Paris, France, has obtained a number of machines, some of them by commandeering, for the French ordnance works. However, the company has issued a general inquiry for further machines, valued at $300,000 or more, which it hopes to pick up in the open market. The inquiry specifies that tools be boxed for export delivered f.o.b. New York, and states that class A-1 priority orders would be secured for all the machines. The list follows:

Three crankshaft grinders, 16 x 66 inches, new or rebuilt; four plain grinders, 12 x 66 inches, new or rebuilt; two slotting machines, 8 to 10-inch stroke, new or rebuilt; four 18-inch bevel gear planers, new or rebuilt one bevel gear cutter, new or rebuilt; two vertical milling machines; 13 plain horizontal milling machines.

Chandler & Co., 35 Pine street, New York, fiscal agents for the Bolivian government, are about to issue an inquiry for general machine shop equipment for a machine shop for the Bolivian state railroad. The V. V. Lebedjeff Engineering & Supply Co., 11 Broadway, New York, has issued a list of machine tools on which it asks prices and deliveries, material to be properly prepared for export and delivered f.a.s. steamer, New York.

Many Buyers Complete Purchases

A number of important government undertakings now are completing their purchases of machine tools. The Ford Motor Co. has placed orders for many tools for work on liberty motors and will close shortly large additional orders of special machines. Dodge Bros., Detroit, have secured most of the equipment needed for their contracts. The New York Air Brake Co., which is reported to have received a $45,000,000 order for shells and other munitions, will close shortly for a long list of special machines. This company has been constantly in the market for shellworking tools, buying in scattered lots of a few tools each. The Watervliet arsenal, Watervliet, N. Y., has closed for practically all the machines it will require for its ordnance shops. The Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., has just increased its capital stock from $500,000 to $1,000,000. Crane dealers are interested in the placing of 60 cranes by the government, which are the estimated requirements of the various shipyards for 1918. Bids on these cranes were opened by the bureau of yards and docks, navy department, Washington, on Dec. 14, but as yet no information has been obtainable relative to their disposition. Within the past few days, the Ohio Locomotive Crane Co., 30 Church street, New York, has received an order for two additional 20-ton cranes from the Submarine Boat Corp. for its plant at Newark Bay, N. J. This order makes a total of 10 cranes to be placed with the Ohio company for this shipyard. The Record Holding Co., 39 Cortlandt street, New York, has issued an inquiry for one wharf crane for shipment to France.

More Tools for Arsenal Required

CHICAGO machine tool dealers are expecting an inquiry soon from the arsenal at Rock Island for a quantity of tools, among which are said to be 160 24-inch lathes with 24-foot beds. The arsenal also has required about $1,000,000 worth of additional equipment due to a change in the recoil mechanism of its ordnance. The Standard Steel Car Co., which has a government contract, has placed considerable machinery with local dealers, one taking about $200,000 worth, but most of this company's requirements probably will be placed in the east. An unusual demand is developing for large planers, of which an unusual number already have been sold, one local dealer having 100 now on order. The small buyer seems to have been frightened entirely out of the market and is not much in evidence. The Chicago, Burlington & Quincy railroad has commenced the construction of its freight terminal in connection with the new Union Station at Chicago and will invest about $1,000,000. This will be equipped with every modern device for handling freight expeditiously. The Remy Electric Co., Anderson, Ind., is preparing to build two factory buildings. The Ross Gear & Tool Works, Lafayette, Ind., is building an addition. The Pennsylvania railroad is preparing to build a machine shop at Richmond, Ind., and the Union Pacific railroad is planning additions to its shops at the Cheyenne, Wyo. The Columbia Steel Co., Pittsburgh, Cal., is building additions which will require several cranes.

Crane Builders Concentrate on Government Work

CRANE builders and makers of other heavy shop and yard equipment report a tendency toward quietness in the Cleveland district. Few orders outside of government business are being received. Some claim this is due to a possible revision downward in price. One large crane builder, with 95 per cent of his shop capacity engaged in government work, states that inquiries have fallen off considerably in the last few weeks, buyers apparently believing it useless to expect to secure equipment when the government's extensive needs command priority. Priority certificates are carrying much shop and yard equipment out of Cleveland. A large manufacturer of conveyors, ash and coal-handling equipment, has orders ahead for the full capacity of his shop for three months. The Pennsylvania railroad at Buffalo recently purchased a

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The Hamill-Hickox Company, District Representatives
Chicago Office: 1370 People's Gas Building
122 So. Michigan Blvd., C. H. Beach, District Sales Manager
Philadelphia Office: 603 Widener Building
Frank Wallace, District Sales Manager
J. E. Dockendorff & Co., 20 Broad Street, New York
General Export Agents

AGATHON STEELS
TRADE MARK

Say you saw it in THE IRON TRADE REVIEW

trimming crane from the Wellman-Seaver-Morgan Co., Cleveland, and this manufacturer recently took an order for a 12-ton ore barge for the Chile Copper Co. In many directions, however, the belief exists that before long, no outside orders will be accepted and that every effort will be concentrated upon the production of equipment to meet the government's needs in the present crisis.

Congressional Inquiry May Affect Market

SEVERAL Cleveland machine tool dealers attribute the past week's intensified buying to the investigation now being carried on by legislators in Washington.

This investigation, it is asserted, is acting as a stimulus tending to further the buying of equipment on a large scale. Other dealers contend that it is entirely too early to speak with certainty on the subject. The latter are not inclined to minimize its significance, however. One representative dealer reports price advance in light tools. These advances average 10 per cent and cover grinders, certain shaper models and light drills. This dealer believes that there is little probability of a revision of machine tool prices downward so long as the labor question retains its pertinence; the cost of materials being relatively unimportant. The Morgan Engineering Co., which is building a huge ordnance plant at Alliance, O., and inquired for approximately 275 machine tools a short time ago, has not closed for its equipment. A large inquiry has been received from the Cambria Steel Co., Johnstown, Pa. The list includes: Two 42 x 42-inch x 12-foot planers; three 6-foot radial drills; four drill presses, one trimming press and a 6000-pound steam hammer. The Pittsburgh Machine Tool Co., Pittsburgh, has asked for prices on two milling machines. A Detroit founder, the Schwarz Foundry Co., is in need of two planers—one 48 x 48 inches x 12 feet; the other, 60 x 60 inches x 16 feet. A request has been received from the Elyria Machine Co., Elyria, O., for quotations on a horizontal drilling machine, which is supplemental to recent purchases of shell-making machinery.

New Construction and Equipment

Concise and Timely Business Building Opportunities from the Field of Industry

Along the Middle Atlantic Seaboard

ALBANY, N. Y.—A fire at the plant of the George H. Thatcher Mfg. Co., Dec. 19, damaged valuable patterns used in the manufacture of parts and equipment for submarine chasers. The loss to buildings and equipment is estimated at $100,000.

ASTORIA, L. I., N. Y.—The Hunoff Machine Works, 45 Mills street, will build a 1-story machine shop to cost $25,000.

BROOKLYN, N. Y.—Work on the new shipbuilding ways for the navy department will be undertaken soon by the Jerrett-Chambers Co., 30 East Forty-second street, New York. The work will cost $310,000.

BROOKLYN, N. Y.—The S. Jackson Tube Co. has been chartered with a capital of $150,000 to manufacture metal tubing. The incorporators are S. Jackson, E. E. Jackson and E. Ebke, 85 Morton street.

BROOKLYN, N. Y.—A 2-story, 130 x 350-foot factory will be erected by the Kenyon Co., 574 Pacific street. William Higginson, 13 Park Row, New York, is drawing plans.

BUFFALO.—The Cygnet Mfg. Co. has been organized with $600,000 capital to engage in a general manufacturing business. The incorporators are C. L. Heintz, L. J. Heintz and E. A. Heintz.

BUFFALO. — The Buffalo Union Furnace Co., Hamburg street, plans to build a new engine and blower plant to cost $15,000.

BUFFALO.—The Commonsense Mfg. Co. will build an addition to its machine shop at 1392 Niagara street.

BUFFALO.—Three factory buildings, one and two stories high, 40 x 100 feet, are being planned by Architect W. S. Brickell for a concern whose name is being withheld.

BUFFALO.—The National Aniline & Chemical Co. has awarded to the J. W. Cowper Co. the general contract for erection of 3-story factory building, 80 x 120 feet to cost $88,500.

DEPEW, N. Y.—The American Car & Foundry Co. plans to remodel three buildings at its plant.

ELMIRA, N. Y.—A 1-story, 56 x 321-foot testing shed to cost $30,000 is planned by the Willys-Morrow Co., John N. Willis, Detroit, president. A $30,000 reassembly building is also planned by the company.

LINDEN, N. Y.—Mac Govern & Co., 114 Liberty street, New York, will receive bids shortly on the erection of a machine shop. Fletcher-Thompson Inc., 1089 Broad street, Bridgeport, Conn., is engineer.

LONG ISLAND CITY, L. I., N. Y.—The Astoria Properties Co. has awarded to Frank L. Wall, 241 Flushing avenue, Astoria, L. I., contract for a 1-story, 48 x 192-foot extension to the plant occupied by the Himoff Machine Co., 45 Mill street, Long Island City. Cost is estimated at $20,000.

NEW YORK.—The New Amsterdam Supply Co. has been organized to manufacture castings and engage in sheet metal work. The incorporators include M. R. Jarvis, S. Kurtz and W. J. Schnaible, 120 East 235th street.

NEW YORK.—The United Metal Spinning Co. has been chartered with a capital of $40,000. The incorporators are L. Seitz, J. F. Forrester and W. O. Langley, 346 Broadway.

NEW YORK.—The Eastern Tool & Machine Co. has been organized with $10,000 capital. Those interested are S. R. Hills, E. F. Hills and C. A. Fisk, 656 Southern boulevard.

NEW YORK.—The Utility Machine Appliance Co. has been granted a charter. The company is capitalized at $10,000 and its incorporators include R. J. Walsh, G. F. Woolston and E. E. Haines, 45 West Thirty-fourth street.

NEW YORK.—The Gas Engine & Power Co., Harlem river and 177th street, plans to build a machine shop.

NEW YORK.—The Alliance Iron & Steel Corp. has been organized by H. C. Gable, H. F. Holly and G. D. Zahm, 261 Broadway. The company is capitalized at $75,000.

NEW YORK.—The American Machine & Foundry Co., Fifty-sixth street and Second avenue, has awarded the contract for the erection of a 5-story, 100 x 185-foot factory to cost $250,000.

NEW YORK.—T. Paulson & Son, Inc., 97 Second avenue, has increased its capital from $30,000 to $100,000 to provide for extensions to its brass foundry.

NEW YORK.—The Russell Fraser Co., 128 Wythe avenue, has increased its capital from $60,000 to $80,000 to provide for additions to its plant for the manufacture of insulated wire.

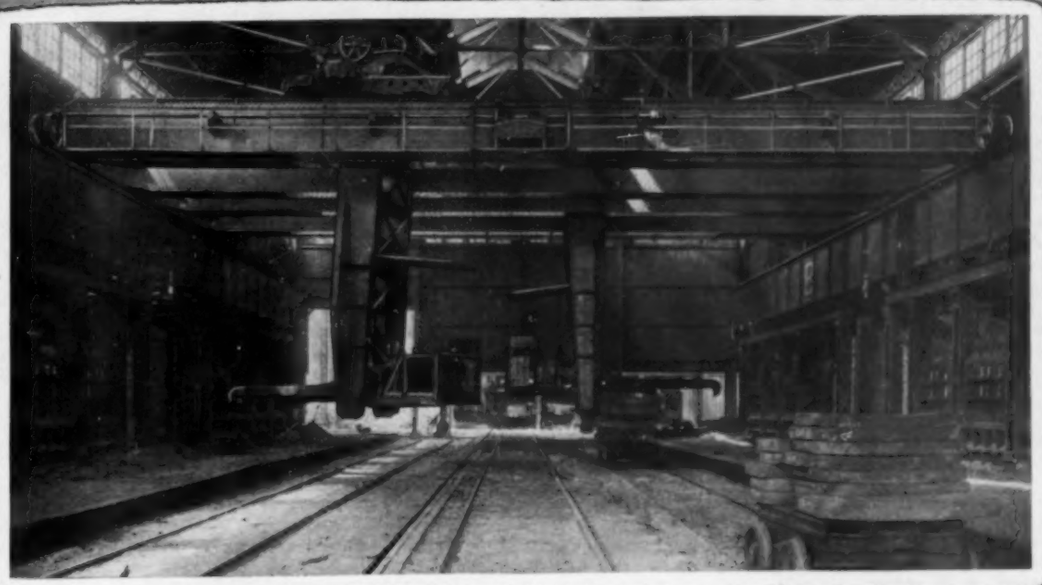
NEW YORK.—H. A. Staples, engineer, 103 Park avenue, is in the market for brass foundry crane equipment.

NEW YORK.—The I. X. L. Machine & Tool Co., 180 Lafayette street, has increased its capital to provide for extensions to its plant.

NEW YORK. — The Deep Drawn Metal Corp. has been chartered with $30,000 capital. The incorporators include C. Stahlberg, W. G. Smith and H. F. Hughes, 730 Riverside drive.

NEW YORK.—Joseph Stern & Son have let the general contract to A. W. Broderick, 110 West Fortieth street, for the erection of a 2-story boiler house extension.

SYRACUSE, N. Y. — The Sanford Motor Co. will build a 1-story, 80 x 80-foot factory



Crane Type Slab Chargers

For charging a single line of furnaces with slabs, blooms, ingots, etc., the W-S-M Crane Type Charger will be found most efficient.

These machines are self-propelling, being electrically operated throughout, and provided with the motors and controllers necessary to place the charger properly before the furnace, to grip and pick up the piece of material to be handled and to charge it into and withdraw it from the furnace, depositing it on Roll Table, Car or Transfer Table as required.

You will find the W-S-M line of slab chargers complete—we have or can make the type and size best suited to your requirements.

The W-S-M Crane Type Slab Chargers pictured above are in the service of the National Tube Company, McKeesport, Pennsylvania.

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Steel Plant Equipment:
Manipulators, Furnaces, Charging Machines, etc.
By-Product Coke Oven Machinery.
Shipyard Cranes.
Hoisting and Mining Machinery.
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Special Large Cranes.
Gas Producers, Gas Valves.
Hydraulic Turbines.
Johnson Hydraulic Valves.
Steel Castings.

WELLMAN SEAVER MORGAN COMPANY
CLEVELAND
OHIO U.S.A.

building to cost $9000. W. W. Taber is architect.

UTICA, N. Y.—The Utica Steam Engine & Boiler Works, Whitesboro street, will build a plant to cost $80,000.

YONKERS, N. Y.—The Max Ames Machine Co., 372 Greenwich street, New York, has awarded to the H. Wales Lines Co., 134 State street, Meriden, Conn., contract for the erection of a $20,000 machine shop, 1-story high and 32 x 141 feet.

ARDMORE, PA.—The Autocar Co. plans to enlarge its plant to provide increased facilities for handling extensive government contracts for trucks.

BEAVER FALLS, PA.—The G. H. Hamilton Mfg. Co., Seventh avenue and Fifth street, has awarded to R. M. McDaniel & Co., New Brighton, Pa., contract for the construction of a new plant. The work will start about March 15.

BRISTOL, PA.—The plant of the Merchants Shipbuilding Co. has recently been severely damaged by fire.

CHESTER, PA.—The Chester Shipbuilding Co. plans extensive improvements to its shipyards, including a 900-foot pier to cost $400,000, an office building, joiner shop, etc. J. Garmey, works manager, is in charge.

FREELAND, PA.—The Freeland Machinery & Iron Co., recently incorporated with $50,000 capital, has secured a site, and will build a plant for the manufacture of ship propellers. W. L. Touhill, Scranton, Pa., is in charge.

HARRISBURG, PA.—The Harrisburg Mfg. & Boiler Co., Nineteenth and Derry streets, plans to erect an addition to its gun-carriage factory. The company has recently obtained a $1,000,000 contract from the government.

KUTZTOWN, PA.—The Kutztown Foundry & Machine Co. will erect an addition to its foundry.

LYKENS, PA.—The Reifft & Nester Co. has been incorporated with a capital of $140,000 to manufacture taps and dies. The incorporators are John S. Reifft, J. P. Nestor and B. M. Kline.

MIFFLINBURG, PA. — The Automobile Body Works has awarded the contract for a 4-story, 60 x 300-foot brick factory building.

NORRISTOWN, PA. — W. L. Browning, Wayne, Pa., who has purchased the machine shop of Lownes & Butler, Washington street, plans to erect an addition and to enlarge the present plant.

PHILADELPHIA.—The William Cramp & Sons Ship & Engine Building Co. has awarded to the Hoffman Engineering & Contracting Co. contract for a 1-story brick and steel brass foundry building, 140 x 200 feet in size, to be built on Richmond street, south of Norris, at a cost of $40,000.

PHILADELPHIA.—The Tacony Ordnance Co. will receive bids shortly for the erection of a $10,000 power house and storage building.

PHILADELPHIA.—The Quaker City Iron Works, 3003 Richmond street, has had plans prepared for a plant addition.

Requires Many Tools

Following is a machine tool list issued by the V. V. Lebedjeff Engineering & Supply Co., 11 Broadway, New York.

One 48-inch x 48-foot crank shaft lathe.
Four facing lathes.
One turning mill.
One planer.
Four planing machines.
Six slotters.
Four radial drills.
Three vertical milling machines.
One thread milling machine.
One universal milling machine.
One portable milling machine.
One gear hobbing machine.
Four horizontal boring mills.
One bevel gear cutter.

All machines listed above are to be of standard types and made by reputable manufacturers.

PHILADELPHIA.—M. L. Bayard & Co., Pennsylvania building, will build an addition to their machine shop at Indiana avenue and Twentieth street, to cost about $5000.

PITTSBURGH.—The Erie Pump & Engineering Co. has been incorporated by J. H. Dougherty, W. N. Siitz and V. M. Dougherty, Erie, Pa.

PITTSBURGH.—The Iron & Fuel Trading Co. has been incorporated with $25,000 capital by William W. Wishart.

SCRANTON, PA. — The National Carbon Co., Cleveland, which recently obtained a site on Washington avenue for the erection of a new plant, has obtained additional ground and will build larger than originally planned.

WHEATLAND, PA.—The Blaw-Knox Co., pressed and welded steel, is preparing plans for additions to double the capacity of its plant.

YORK, PA.—The Cochrane Brass Foundry Co., Wallace street, has obtained a permit to build an addition to its plant.

BLOOMFIELD, N. J.—The Power Specialty Co., 111 Broadway, New York, will build a factory on Locust avenue to cost $31,000.

BLOOMFIELD, N. J.—The Sprague Electric Works of the General Electric Co. has had plans prepared for the erection of a 1-story 50 x 100-foot addition to its plant. The cost is estimated at $10,000.

JERSEY CITY, N. J.—The American Standeal in metal goods. The incorporators are E. B. Cadwell, Howard Brooks and John H. Wynne.

JERSEY CITY, N. J.—The Standard Electric Mfg. Co. has been chartered with $200,000 capital to manufacture and deal in electric goods. Jules E. Brand, H. A. Black and Walter T. Hilton are the incorporators.

JERSEY CITY, N. J.—W. Ames & Co., 417 Communipaw avenue, will erect a 3-story 50 x 125-foot addition to their plant, to cost about $10,000.

JERSEY CITY, N. J.—An addition will be made to the power house of the American Sugar Refining Co. The proposed structure will be 1-story high, 18 x 75 feet and will cost $10,000.

Activities in the Central States

JANESVILLE, WIS.—The Janesville Electric Co. plans to install an additional 150-horsepower water turbine unit in its hydro-electric plant.

KAUKAUNA, WIS.—The Hoehne Machine Works has been granted a charter with a capital of $35,000. The incorporators include Fred, Herman and W. M. Hoehne.

KENOSHA, WIS.—Articles of incorporation have been filed by the Monarch Auto Lock Co. Capital stock is $100,000 and the incorporators are Frank R. Hancock, Ronald F. Hoffman and Hans J. Krogh.

MADISON, WIS.—Plans are being prepared for a new foundry and machine shop for the Southern Foundry Co., to replace the plant damaged by fire several weeks ago. Cost will be about $50,000.

MANITOWOC, WIS.—The common council is contemplating the construction of a viaduct over the Manitowoc river at Tenth street. J. C. Schroeder is mayor.

MENOMONIE, WIS.—The Commercial club is considering plans for the organization of a heating plant of the vacuum type. Plans are company to build and operate a central steam being prepared by T. L. Thorson and Louis F. Olson.

MILWAUKEE.—The Modern Steel Treating Co. has been organized by George Haubert, president of the Crary Tool Co., to engage in heat treating of metals and general metallurgical work.

MILWAUKEE.—Percy Braman, acting commissioner of public works, will soon call for bids on strengthening and reinforcing the Humboldt avenue bridge, which will require from 45 to 50 tons of structural steel.

MILWAUKEE. — The Northwestern Malleable Iron Co., 756 Park street, has awarded contracts for the erection of a new chipping room to cost about $15,000.

MILWAUKEE.—The Liberty Mfg. Co., with a capital of $200,000, has been organized by William Laddiemire, Walter J. Raley and William J. Schubert to manufacture automobile and truck parts and accessories. Messrs. Schubert and Raley are associated with the Milwaukee Auto Specialty Mfg. Co., Seventh and Chestnut streets.

MILWAUKEE.—The Milwaukee Structural Steel Co. has taken the contract for improvements to the Cherry street drawbridge at the contract price of $3740. About 46 tons of structural steel will be required.

MILWAUKEE. — Schnetzky & Son, architects, are preparing plans for a 5-story fireproof manufacturing plant at South Pierce street and Muskego avenue for the Milwaukee Paper Box Co., 400 Florida street. The dimensions are 150 x 150 feet and the cost is estimated at $250,000. Bids will be taken shortly after Jan. 1.

NEW HOLSTEIN, WIS. — The capital stock of the John Lauson Mfg. Co., gasoline engines, farm machinery and tractors, has been increased from $500,000 to $1,000,000 for the purpose of developing its tractor business. Enlargement of the plant also is contemplated.

OAKWOOD, WIS.—Contract for building a reinforced concrete and steel bridge over Oak creek will be awarded to the General Construction Co., 587 Eighth avenue, Milwaukee, low bidder at $13,450.

RACINE, WIS.—A charter of incorporation has been granted to the Thor Machine Works Co., capitalized at $20,000. The fol-

lowing are interested: Knud F. Jacobson, K. H. Studt and Andrew Astrey.

SHEBOYGAN, WIS.—C. U. Boley, city engineer, is preparing plans for a draw-span over the Manitowoc river at Fourteenth street to replace the present swing bridge. The new bridge will be 140 feet long.

WAUWATOSA, WIS.—J. D. Morrison, 625 Sixty-ninth avenue, Milwaukee, has been awarded the general contract for the erection of a $20,000 gray iron foundry for the Liberty Foundry Co. This concern has been organized recently by Gerhard W. Mockly, Milwaukee, with $30,000 capital to manufacture small castings for automobiles, trucks, tractors, etc. The main shop will be 65 x 120 feet and located at Watertown road and Fifty-ninth street.

BATTLE CREEK, MICH. — The Regle Brass Co. has been granted a charter of incorporation. The company is capitalized at $100,000 and its incorporators are James B. Couture, James H. Mustard and others.

BIG RAPIDS, MICH.—The Four Drive Tractor Co. will erect an addition to its plant in the spring. J. C. Jenkins is in charge.

DETROIT.—The Detroit Shell Co. has been incorporated with a capital of $200,000. The incorporators are Roscoe A. Jackson, Walter E. Flanders and M. M. Jewett.

DETROIT.—Fire caused $20,000 damage to the plant of the Art Brass & Wire Works, Ellery street and East Forest avenue.

DETROIT.—The war department has ordered that six new bridges be erected over River Rouge, near the site of the Ford smelting plant, to be 125 feet in length.

FLINT, MICH.—The heat treating plant of the Armstrong Steel Spring Works has been damaged by fire. The company will rebuild.

GRAND RAPIDS, MICH. — The Grand Rapids Airplane Co. has been organized with $200,000 capital. Samuel D. Young is president.

PONTIAC, MICH. — The Michigan Drop Forge Co. has taken on a large amount of war business and will operate 24 hours a day until additions which will double its capacity have been provided.

WYANDOTTE, MICH.—The Detroit Shipbuilding Co., M. E. Farr, president, foot of Orleans street, will build a plant.

CHICAGO. — The International Air Ship Corp. has let a contract to N. P. Severin, 82 West Washington street, for an airplane factory 100 x 600 feet in size. The building will be of brick, concrete and steel construction, and will cost about $200,000.

CHICAGO.—George P. Nichols & Bros., 37 West Van Buren street, will build a plant for the manufacture of railroad machinery.

CHICAGO.—The William Glader Machine Works, Walter J. Glader, secretary, 210 Ann street, has let the contract for a 1-story machine shop with foundation and walls to carry two additional stories, at a cost of $20,000.

CHICAGO.—James L. Sparks, 320 West Grand avenue, brass founder, will build a 1-story foundry, 48 x 125 feet, in size, to cost $12,000.

CICERO, ILL.—The Western Electric Co. will build a brick factory 37 x 249 feet in size.

EAST ST. LOUIS, ILL.—The Excelsior Tool & Machine Co., founder and machinist, is asking bids on the construction of a foundry addition to be of brick and steel construction, with metal sash. New equipment required will include a core oven and two electric cranes. The company also plans to erect a 2-story fireproof pattern storage building. T. F. Philippi, president, is in charge.

HAVANA, ILL.—The Havana Metal Wheel Co. will install considerable new machinery to take care of government contracts for transport wagons which it has undertaken.

MOLINE, ILL.—Deere & Co., F. Horton, secretary, 1325 Third street, plan to erect an additional plant for the manufacture of agricultural implements at a cost of $1,000,000.

MORTON, ILL.—The A. J. Meyer Mfg Co., manufacturer of metal buckets, plans an addition 75 x 130 feet in size, to its factory

EAST CHICAGO, IND.—The Green Engineering Co. will build a manufacturing building 60 x 80 feet in size, to cost $11,000.

EAST CHICAGO, IND.—The main building of the William Graver Tank Works has been severely damaged by fire with a loss estimated at $70,000 to $80,000.

HAMMOND, IND. — The Standard Steel Car expects to start work shortly on an addition to its machine shop. The building will be 1-story high and 250 x 800 feet, and will cost $250,000. The McClintic-Marshall Co., Pittsburgh, is the contractor.

PETERSBURG, IND.—The dynamo building, machine shop, generators and motors at the plant of the S. W. Little Coal Co. have been damaged by fire with a loss estimated at $9000.

VINCENNES, IND. — The Baltimore & Ohio railroad will erect a $100,000 freight depot at First and Scott streets.

BLANCHESTER, O. — The Fulflo Pump Co., Cincinnati, has purchased a site of 5 acres on the Baltimore & Ohio railroad and plans to build a 2-story machine shop and a foundry. The company manufactures pumps in cast iron, brass, bronze and aluminum.

BUCYRUS, O.—The American Clay Machinery Co. has obtained a permit for the construction of a new factory on Harris avenue. R. O. Perrot is in charge.

CINCINNATI.—The J. H. Fay & Egan Co., manufacturer of woodworking machinery, will build a new plant at Paddock road and the Baltimore & Ohio railroad. A bond issue of $500,000 to provide for this addition has been authorized.

CLEVELAND.—The Brown Hoisting Machinery Co. has awarded to the Austin Co., 14230 Euclid avenue, contract for the erection of a 1-story addition, 52 x 182 feet, to its plant at 4406 St. Clair avenue. The building will cost $134,300.

CLEVELAND.—The American Multigraph Co., 181 East Fortieth street, has awarded to the Crowell-Lundoff-Little Co. contract for the erection of a 1-story 45 x 60-foot addition to its factory, to cost $5500. The company has been manufacturing munitions for the government.

CLEVELAND.—The Permanent Products Co., 1020 Engineers building, will build a factory to be one and two stories high, 60 x 275 feet. The cost is estimated at $50,000. The company has been organized recently, with R. D. Stevenson as general manager.

CLEVELAND.—The plant of the Bowler Foundry Co., Columbus road, has been severely damaged by fire, with a loss estimated at $100,000. J. H. Bruce is general manager of the company.

CLEVELAND.—The Clay Engine Mfg. Co. plans to erect an addition to its plant at 6850 Kinsman road.

CLEVELAND.—The Elliott Electric Co., 322 Champlain street, plans to build an addition to its plant for the manufacture of electrical devices.

CLEVELAND. — The Northern Fire Appliance Co. has awarded the contract for a 50 x 100-foot factory to be erected on East 152nd street.

CLEVELAND.—J. W. Smith, 10585 Quincy avenue, plans to erect a 1-story forge shop on Quebec avenue, to cost about $10,000.

CLEVELAND.—The Paralyte Co. has been organized with $25,000 capital to manufacture metal products. The incorporators are J. S. Kohn, L. M. Young, Charles E. Phipps, M. S. Leitner, 1239 West Ninth street, and others.

DAYTON, O.—The Recording & Computing Machine Co. has purchased a factory building which it will equip with new machinery. W. I. Ohmer is president of the company, which has offices on Essex avenue.

DAYTON, O.—The Ohmer Fare Register Co. has obtained a permit to build a $20,000 factory adjoining its plant on Holmstead avenue.

EUCLID, O.—The Cleveland Tractor Co. will build an addition to its plant. G. S. Rider & Co., Century building, is engineer.

EUCLID, O.—The Euclid Crane & Hoist Co. has purchased a 1-acre site adjoining a tract of four acres which it has recently acquired with a view to erecting a number of plant additions.

FOSTORIA, O.—The Hydrocarbon Wickless Burner Co., recently incorporated with a Delaware charter, will erect one of its seven proposed plants in this city. Harry J. Sommers is president.

LIMA, O.—The Lima Rivet & Forging Co., recently incorporated with $300,000 capital, is considering a site for a factory. George D. Phillips is in charge.

LINDENWALL, O.—The Liberty Machine Tool Co., which has been incorporated recently with $100,000 capital, has awarded to F. K. Vaughn contract for the construction of a factory to be 100 x 200 feet in size, of brick and steel construction. A. R. McCann, Cincinnati, is general manager of the company, which will manufacture planers.

MARION, O.—Frank Crow, Buffalo, has secured a site on which he plans to erect a brass and bronze foundry shortly.

TOLEDO, O.—The Acklin Stamping Co. has awarded the contract for an addition to its factory.

TOLEDO, O.—The Mather Spring Co., Castle boulevard, has awarded the contract for a factory addition.

YOUNGSTOWN, O.—The Brier Hill Steel Co. has purchased a tract of land on the north side of the Mahoning river upon which it plans to build a third blast furnace plant and a tandem plate mill.

ZANESVILLE, O. — The Kearns-Gorsuch Mfg. Co. has purchased a tract of 96 acres, upon which it contemplates the erection of a manufacturing plant.

ZANESVILLE, O.—The round house of the Baltimore & Ohio railroad has been damaged seriously by fire, with a loss of $10,000. C. E. Brannon, chief clerk, is in charge of reconstruction.

BRAMWELL, W. VA.—The National Carbide Co. plans to build a chemical plant to cost $500,000.

CHARLESTON, W. VA.—The Powhatan Brass & Iron Works will build a 1-story addition to its foundry.

CHARLESTON, W. VA.—The Charleston-Dunbar Traction Co. will build a new power plant to replace that recently damaged by fire. Col. Fred P. Trosscep is president.

HUNTINGTON, W. VA. — Meanor & Sweeney, architects, 917 R & P building, are taking bids on a 160 x 500-foot factory to be built by the Virginia Pottery Co.

PENNSBORO, W. VA.—The Kerr Bros. Machine Co. will build a 1-story machine shop for the manufacture of oil-well tools and equipment.

Iron and Steel Prices

Corrected to Tuesday Noon

IRON ORE

Superior Ores, Per Ton, Lower Lake Ports.	
Old range Bessemer, 55 iron	$5.95
Mesabi Bessemer, 55 iron	5.70
Old range non-Bess., 51½ iron	5.20
Mesabi non-Bess., 51½ iron	5.05
Port Henry Ores, non-Bessemer, Per Unit, Delivered Eastern Pennsylvania.	
Old Bed, crude 55 iron	10.50c to 11.00c
Old Bed., concent., 65 iron	11.00c to 11.50c
Harmony, concent., 63 iron	11.50c to 11.75c
Lump (at mines)	$5.75c

WAREHOUSE PRICES

Steel bars, Chicago	4.10c
Steel bars, Cleveland	4.035c
Steel bars, Detroit	4.085c
Steel bars, Philadelphia	4.10c
Steel bars, New York	4.095c
Steel bars, St. Louis	4.17c
Steel bars, Cincinnati	4.08½c
Steel bars, St. Paul	4.22c
Steel bars, Buffalo	4.05c
Iron bars, Buffalo	4.65c
Iron bars, Chicago	4.10c
Iron bars, Cleveland	3.985c
Iron bars, Detroit	4.75c
Iron bars, St. Louis	4.17c
Iron bars, Cincinnati	4.08½c
Iron bars, Philadelphia	4.50c
Iron bars, New York	4.659c
Shapes, Chicago	4.20c
Shapes, Detroit	4.185c
Shapes, St. Louis	4.27c
Shapes, St. Paul	4.32c
Shapes, New York	4.195c
Shapes, Cleveland	4.135c
Shapes, Philadelphia	4.20c
Shapes, Buffalo	4.15c
Shapes, Cincinnati	4.18½c
Plates, Buffalo	4.40c
Plates, Chicago	4.45c
Plates, Detroit	4.435c
Plates, St. Louis	4.52c
Plates, St. Paul	4.57c
Plates, New York	4.445c
Plates, Cleveland	4.385c
Plates, Philadelphia	4.45c
Plates, Cincinnati	4.43c
No. 10 blue anl. sheets, Chi.	5.45c
No. 10 blue anl. sheets, Cleve.	5.00c
No. 10 blue anl., Buffalo	5.40c
No. 10 blue anl., shets, St. L.	5.52c
No. 10 blue anl. sheets, Cinci.	5.43c
No. 10 blue anl. sheets, St. Paul	5.57c
No. 10 blue anl. sh., Detroit	5.435c
No. 28 black sheets, Chgo.	6.45c
No. 28 black sheets, Cleve.	6.35c
No. 28 black sheets, Cinci.	5.45c
No. 28 black, Detroit	6.435c
No. 28 black sheets, St. L.	6.52c
No. 28 black sheets, St. Paul	6.57c
No. 28 galv. sheets, Chgo.	7.70c
No. 28 galv. sheets, Cleve.	7.60c
No. 28 galv. sheets, Cinci.	6.65c
No. 28 galvanized, Detroit	7.685c
No. 28 galv. sheets, St. L.	7.77c
Hoops, Cleveland	8.00c
Hoops, Detroit	6.50c

IRON AND STEEL SCRAP

STEEL WORKS USE

(Gross Tons)

Bundled sheets, Pittsburgh	$22.00 to 23.00
Bundled sheets, Cleveland	22.00 to 22.50
Bundled sheets, Buffalo	19.00 to 20.00
City wrought, short, N. Y.	25.00 to 26.00
Frogs, switches, guards, St. L.	29.00 to 29.50
Heavy melting steel, Pitts.	30.00
Heavy melting steel, Buffalo	30.00
Heavy melting steel, Chgo.	30.00
Heavy melt'g steel, Cleveland	30.00
Heavy melting steel, Cinci.	27.00 to 27.50
Heavy melting steel, east. Pa.	27.00 to 29.00
Heavy melting steel, N. Y.	26.00 to 26.50
Heavy melting steel, St. L.	27.00 to 27.50
Heavy melting steel, Birming.	21.50 to 22.50
Hydraulic press. sheets, Cleve.	25.00 to 25.50
Hydraulic press. sheets, Pitts.	24.00 to 25.00
Hydraulic press. sheets, Chgo.	26.00 to 26.50
Low phos. steel, Buffalo	40.00 to 42.00
Low phos. steel, Pittsburgh	38.00 to 40.00
Low phos. steel, eastern Pa.	35.00 to 37.00
Shoveling steel, Chicago	30.00
Shoveling steel, St. Louis	26.00 to 26.50
Steel rails, short, Chicago	34.00 to 34.50
Steel rails, short, Cleveland	31.00 to 32.00
Steel rails, short, St. Louis	36.50 to 37.00
Steel rails, old, Birmingham	28.00 to 30.00
Stove plate, Cincinnati	16.00 to 16.50
Stove plate, St. Louis	16.50 to 17.00
Stove plate, N. J. points	19.50 to 20.00
Stove plate, Birmingham	18.50 to 20.00
Stove plate, Buffalo	22.00 to 23.00
Stove plate, eastern Pa.	22.00 to 23.00
Stove plate, Cleveland	19.00 to 20.00
Stove plate, Pittsburgh	20.00 to 21.00
Cast iron borings	11.00 to 12.00

(Net Tons)

Boiler plate, cut, No. 1, Chgo.	$21.00 to 22.00
Boiler plate, cut, No. 1, St. L.	19.50 to 20.00
Bundled sheets, Cincinnati	17.00 to 17.50
Knuckles, coup., Chicago	34.00 to 34.50
Knuckles, coup., St. Louis	30.50 to 31.00
Springs, Chicago	39.50 to 40.00
Stove plate, Chicago	21.00 to 22.00

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:	
Cleveland	$0.95
Newark, N. J.	3.50
Boston	3.70
Philadelphia	3.30
Pittsburgh	.95
St. Louis	3.18
Minneapolis, St. Paul	4.54
Buffalo to:	
Albany, N. Y.	$1.26
New England (rail)	3.10
New York and Brooklyn (rail)	3.10
Virginia furnaces to:	
Philadelphia	$3.27
New England	3.77
Brooklyn, Jersey City, Newark	3.52
Birmingham, Ala., to:	
Boston	6.00
Cincinnati	2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
Minneapolis, St. Paul	5.85
New York (r. and w.)	6.00
Philadelphia (r. and w.)	5.25
Pittsburgh	4.90
Savannah, Ga.	2.75
St. Louis	3.40
Chicago to:	
Des Moines	$2.80
Milwaukee	.50
Minneapolis, St. Paul	2.00
Moline, Ill.	1.15
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58
Minneapolis, St. Paul	4.54
Duluth, Minn., to:	
Minneapolis-St. Paul	$1.25
Mayville, Wis.:	
Minneapolis-St. Paul	$1.75

Freight Rates, Finished Material

Pittsburgh, carloads, per 100 lbs., to:	
New York	19.5 cents
Philadelphia	18.5 cents
Boston	21.5 cents
Buffalo	16.0 cents
Baltimore	18.0 cents
Cleveland	13.5 cents
Cincinnati	17.0 cents
Chicago	21.5 cents
Detroit	15.7 cents
Minneapolis and St. Paul	32.9 cents
Denver	79.0 cents
St. Louis	27 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	75 cents
Pacific coast (tin plate)	75 cents

IRON MILL USE

(Gross Tons)

Busheling, No. 1, Cleveland	25.75 to 26.75
Busheling, No. 1, Buffalo	26.00 to 27.00
Busheling, No. 2, Buffalo	17.00 to 18.00
Busheling, No. 1, Pittsburgh	21.00 to 22.00
Cast borings, New York	16.50 to 17.00
Cast borings, eastern Pa.	19.00 to 20.00
Cast borings, Cleveland	20.00
Cast borings, Buffalo	19.00 to 20.00
Cast borings, Pittsburgh	20.00
Cast borings, Birmingham	13.00 to 15.00
City wrought, long, N. Y.	31.00 to 32.00
Forge flashings, small, Cleve.	24.50 to 25.50
Forge flashings, large, Cleve.	24.00 to 25.00
Forge No. 1, Eastern Pa.	22.50 to 23.50
Grate bars, Buffalo	20.00 to 21.00
Grate bars, Cleveland	20.00 to 21.00
Grate bars, N. J. points	19.50 to 20.00
Iron axles, Pittsburgh	42.00 to 44.00
Iron axles, Cincinnati	42.00 to 42.50
Iron axles, Cleveland	49.50 to 50.00
Iron axles, eastern Pa.	50.00 to 55.00
Iron axles, Chicago	36.00 to 37.00
Iron rails, Chicago	38.00 to 39.00
Iron rails, Buffalo	37.00 to 38.00
Iron rails, Cincinnati	32.50 to 33.00
Iron rails, St. Louis	35.50 to 36.00
Iron rails, Cleveland	40.00 to 40.50
Machine turnings, Cleve.	20.00
Machine turnings, Buffalo	18.00 to 18.50
Machine turnings, N. Y.	16.00 to 16.50
Machine turnings, Pitts.	20.00
Machine turnings, east. Pa.	18.50 to 19.50
Machine turnings, Birming.	17.50 to 18.50
Pipes and flues, Cleveland	23.75 to 24.75
R. R. mch. cast, No. 1, Buff.	32.00 to 33.00
R. R. wrgt. No. 1, Buffalo	35.00
R. R. wrgt., No. 1, east, Pa.	35.00
Railroad wrgt., No. 1, Cleve.	35.00
R. R. wrought, No. 1. Pitts.	35.00
R. R. wrgt. No. 1, Birming.	28.00 to 35.00
Wrought pipe, Buffalo	26.00 to 27.00
Wrought pipe, eastern Pa.	30.00 to 32.00
Wrought pipe, New York	30.00

(Net Tons)

Angle bars, iron, Chicago	$37.00 to 37.50
Angle bars, steel, St. Louis	25.00 to 26.00
Arch bars & transoms, St. L.	42.00 to 42.50
Arch bars & transoms, Chgo.	37.50 to 38.50
Busheling, No. 1, Chicago	25.00 to 26.00
Busheling, No. 1, Cincinnati	21.00 to 21.50
Busheling, No. 1, St. Louis	22.50 to 23.00
Busheling, No. 2, Chicago	16.50 to 17.50
Cast borings, Cincinnati	13.00 to 13.50
Cast borings, St. Louis	16.00 to 16.50
Cast borings, Chicago	17.00 to 17.50
Cut forge, Chicago	29.50 to 30.00
Iron axles, St. Louis	44.00 to 44.50
Iron axles, Chicago	47.00 to 48.00
Machine turnings, Chgo.	17.00 to 17.50
Machine turnings, Cinci.	13.00 to 13.50
Machine turnings, St. L.	16.75 to 17.25
Pipes and flues, Chicago	22.00 to 23.00
Pipes and flues, St. Louis	21.50 to 22.00
Railroad wrgt., No. 1, Chgo.	31.25 to 32.25
Railroad wrgt., No. 1, Cinci.	28.50 to 29.00
Railroad wrgt., No. 1, St. L.	31.00 to 31.50
Railroad wrogt. No. 2, Chgo.	29.50 to 30.00
Railroad wrgt., No. 2, St. L.	29.00 to 29.50

IRON OR STEEL WORKS USE

(Gross Tons)

Axle turnings, Cleveland	$23.00 to 24.00
Axle turnings, Buffalo	26.00 to 27.00
Shafting, New York	34.00
Shafting, eastern Pa.	38.00 to 40.00
Steel car axles, Birmingham	32.00 to 33.00
Steel car axles, New York	46.00
Steel car axles, Buffalo	45.00
Steel car axles, Cleveland	46.00 to 47.00
Steel car axles, Pittsburgh	40.00 to 42.00
Steel car axles, eastern Pa.	50.00 to 55.00

(Net Tons)

Shafting, St. Louis	30.50 to 31.00
Steel car axles, St. Louis	42.50 to 43.00
Steel car axles, Chicago	43.50 to 44.50

IRON FOUNDRY USE

(Gross Tons)

Car wheels, (iron), Pitts.	30.00 to 31.00
Car wheels, (steel), Pitts.	33.00 to 35.00
Car wheels, eastern Pa.	33.00 to 35.00
Car wheels, Buffalo	33.00 to 34.00
Car wheels, Chicago	33.00 to 34.00
Car wheels, St. Louis	29.50 to 30.00
Car wheels, Birmingham	25.00 to 30.00
Car wheels, Cleveland	26.50 to 27.00
Tram car wheels, Birming.	21.00 to 25.00
Cast, No. 1, Birmingham	24.00 to 26.00
Cast, 1, machv., N. J. points	32.00 to 33.00
Cast No. 1, Cleveland	27.75 to 28.00
Cast, 1, heavy, N. J. points	30.00
Cast, No. 1, eastern Pa.	31.00 to 33.00
Cast, No. 1, Pittsburgh	28.00 to 29.00
Malleable railroad, Cincinnati	20.50 to 21.00
Malleable railroad, Cleveland	27.00 to 27.50
Malleable railroad, Buffalo	31.00 to 32.00
Malleable railroad, Pittsburgh	28.00 to 29.00
Malleable railroad, east. Pa.	30.00 to 32.00

(Net Tons)

Cast, No. 1, Chicago	27.00 to 27.50
Cast, No. 1, Cincinnati	26.00 to 26.50
Cast, No. 1, St. Louis	21.50 to 22.00
Malleable railroad, Chicago	28.00 to 28.50
Malleable railroad, St. Louis	25.00 to 26.00
Malleable agricultural, Chgo.	24.00 to 25.00

MISCELLANEOUS USES

(Gross Tons)

Reroll. rails, 5 ft. & ov., Pitts.	$34.00 to 36.00
Reroll. rails, 5 ft. & ov., Chgo.	36.00 to 36.50
Reroll. rails, 5 ft. & ov., E. Pa.	37.00 to 40.00
Reroll. rails, 5 ft. & ov., St. L.	35.50 to 36.00
Reroll. rails, 5 ft. or ov., Cleve.	37.00 to 38.00
Rerolling rails, long, Birming.	37.50 to 38.50

(Net Tons)

Boiler punchings, Chicago	31.50 to 32.00
Locomotive tires, Chicago	36.00 to 37.00
Locomotive tires, St. Louis	32.50 to 33.00

Blue Chip

HIGH SPEED
AND OTHER

Firth-Sterling
TOOL STEELS

The knowledge, experience and skill of Sheffield combined with the best Pittsburgh practice have made these steels the Standards of Quality and Uniformity wherever tools are used.

Firth-Sterling Steel Company
McKEESPORT, PA.
Boston New York Philadelphia Chicago
Cleveland Pittsburgh

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THE HAGAN
Steam Jet Ash Conveyor

The **"Hagan"** is a combination of all the good points of **other** Steam Jet Conveyors, scientifically worked in with a number of **"Hagan" Special Features.**

The result is a Steam Jet Ash Conveyor that will out-service all others in **every** particular.

The Hagan can't waste your steam unless you consent to it!

This point ***alone*** is a ***Decisive*** Feature.

HAGAN GUARANTEES INSURE
Service—Efficiency—Economy

They have backed the operation of over 5,000 Stokers sold in the last three years.

Ask us to send you our Bulletins.

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BESSEMER MALLEABLE
PIG IRON
FOUNDRY BASIC
IRON ORES

WHARTON STEEL CO.
120 BROADWAY NEW YORK, N.Y.
Furnaces and Mines Wharton, N.J.

ILLINOIS ILLINOIS

Illinois Steel Company

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Chicago, Illinois

PIG IRON

"BayView" "BayView"

Northern Foundry Malleable Bessemer

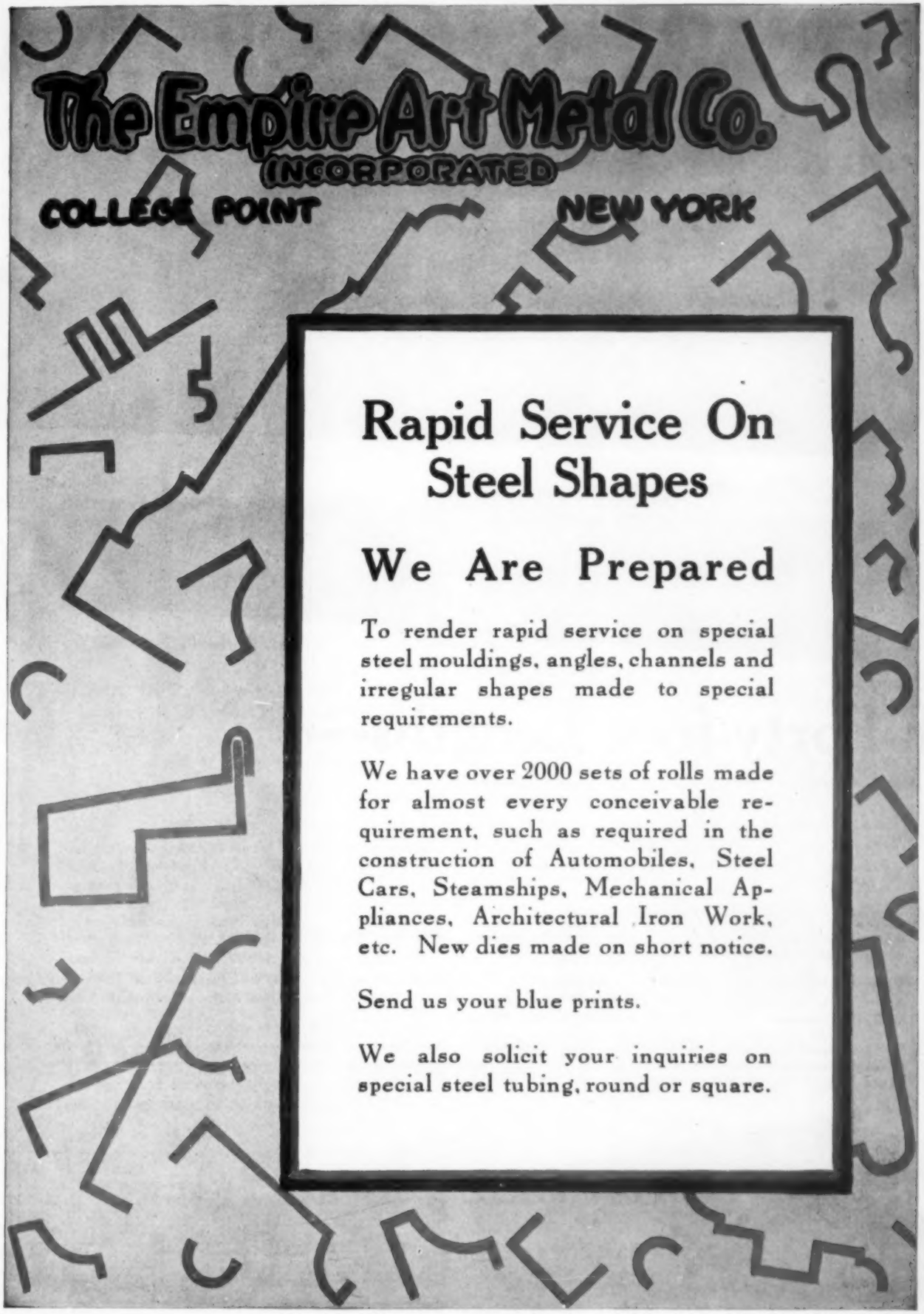
Branch Offices

Birmingham—Brown-Marx Building
Boston—John Hancock Building
Buffalo—Marine National Bank Building
Cincinnati—Union Trust Building
Cleveland—Rockefeller Building
Denver—First National Bank Building
Detroit—Ford Building
New Orleans—Maison Blanche
New York—Hudson Terminal Building
Philadelphia—Widener Building
Pittsburg—Carnegie Building
St. Louis—Third National Bank Building
St. Paul—Pioneer Building

Pacific Coast Representatives
U. S. Steel Products Co., San Francisco, Seattle, Portland, Los Angeles

Export Representatives—U. S. Steel Products Co., New York City

ILLINOIS ILLINOIS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INCORPORATED
COLLEGE POINT
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Rapid Service On Steel Shapes
We Are Prepared
To render rapid service on special steel mouldings, angles, channels and irregular shapes made to special requirements.
We have over 2000 sets of rolls made for almost every conceivable requirement, such as required in the construction of Automobiles, Steel Cars, Steamships, Mechanical Appliances, Architectural Iron Work, etc. New dies made on short notice.
Send us your blue prints.
We also solicit your inquiries on special steel tubing, round or square.

THE A. B. C. OF "NAT

F-Forty-foot Lengths—

FOREWORD. The world's history and literature has been brought before English speaking people by an alphabet of 26 letters. Everything that has been, or now is, or shall be, may be clearly recorded by these few symbols.

¶ Could any other medium than the simple A B C's tell the story of a great industry as completely? No!

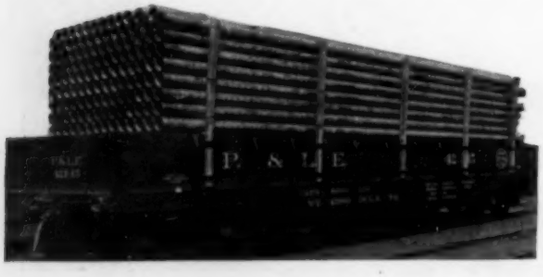
¶ Therefore the story of "NATIONAL" Pipe will be told in these pages—one letter of the alphabet at a time—each separate letter including some important advantage, condition or action which has been a forward step in the progress of "NATIONAL" Pipe from the organization of NATIONAL TUBE COMPANY (1868) up to the present day.

¶ Watch the pages of this publication from week to week for the complete series—A to Z.

¶ Until National Tube Company made "double length", or 40-ft., "NATIONAL" Pipe, the maximum length of pipe was about twenty feet.

¶ Special furnaces were necessary to produce 40-ft. "NATIONAL" Pipe, but as it was foreseen that the result would be a very considerable saving to the consumer in certain types of installations, the experiment—necessarily an expensive one to the manufacturer—was made.

¶ While double length "NATIONAL" Pipe is made to specification only, for special shipping and other arrangements are entailed, yet the saving in many installations has justified the experiment and proved the value of 40-ft. "NATIONAL" Pipe.



Say you saw it in THE IRON TRADE REVIEW

IONAL" PIPE SERVICE

¶ That "Forty-Foot" "NATIONAL" Pipe is a success, may be demonstrated by citing just one typical case:

Inspecting, Coating and Testing Steel Pipe* for 112 Mile High-Pressure Gas Line from Taft to Los Angeles, California†

"The pipe line was designed to work at an initial pressure of 450 lbs., and a terminal pressure of 50 lbs., which would give a delivery capacity of 26,000 million cubic feet per day. The pipe ordered was plain-end steel tubing, 12¾ in. outside diameter, weighing nominally 33 lbs. per lineal foot. About 75 miles of this pipe was of double length, ranging from 34 ft. to 40 ft. in length; the balance was standard, 18 ft. to 20 ft. lengths. By using the double lengths of pipe, in the valleys on the north and south ends of the line, a saving of approximately $31,000 in the cost of couplings alone was effected for the benefit of the client."

*This was "NATIONAL" Pipe.
†From Engineering & Contracting, April 1, 1914, page 382.

¶ A lesser, but still a "worth while" saving is also effected in handling and transportation costs, particularly in mountainous and desert districts.

¶ "NATIONAL" Pipe is made in all lengths up to and including 40-ft., both in plain end and Matheson joint, but as far as known no other welded pipe is made in 40-ft. lengths.

¶ The double length is another of the indications of the general policy of National Tube Company to keep "ahead of the future" in all matters connected with "NATIONAL" Pipe Service.

Previously Published

A—ADVANTAGES, October 18, pages 8 and 9
B—BUILDINGS, November 1, pages 8 and 9
C—COMPLETE LINE, November 15, pages 8 and 9
D—DUCTILITY, November 29, pages 6 and 7
E—EXHIBITS, December 13, pages 6 and 7

TO APPEAR
January 3, G. Growth

NATIONAL TUBE COMPANY

General Sales Offices, Frick Building **PITTSBURGH, PA.**

DISTRICT SALES OFFICES

Atlanta Boston Chicago Pittsburgh Denver St. Louis New Orleans St. Paul Salt Lake City New York Philadelphia

Pacific Coast Representatives: U. S. STEEL PRODUCTS CO., San Francisco, Los Angeles, Portland, Seattle
Export Representatives: U. S. STEEL PRODUCTS CO., New York City

Say you saw it in THE IRON TRADE REVIEW

BETHLEHEM STEEL COMPANY

SOUTH BETHLEHEM, PENNSYLVANIA

PIG IRON: Basic, Bessemer, Foundry, Low Phosphorus, Mayari, Ferro-Manganese, Spiegeleisen.

CASTINGS: Steel and Iron, Brass, Bronze and Manganese.

FORGINGS: Drop, Hammered, Hydraulically Pressed, Solid and Hollow, Rough, and Finished Machined.

RAILS: Standard, Girder, Guard, High Tee, Industrial; Splice Bars, Tie Plates, Bolts, Frogs, Switches, Signals.

SWITCH STANDS: To Meet Every Track Condition; High, Intermediate and Low Stands, Adjustable and non-Adjustable.

MANARD ANVIL-FACE FROGS: Equipped with "Mayari" Never-Turn Bolts. All Bolts Receiving Side Thrust of Wheels are HEAT TREATED.

STRUCTURAL STEEL SHAPES: Bethlehem Beams, Girders and Columns; Standard Beams, Channels and Angles.

TOOL STEELS: Carbon, High Speed, Drill, Finishing and Special.

STANDARD ALLOY AND SPECIAL STEELS: Chrome Nickel, Chrome-Vanadium, Mayari, Case Hardened, Special; Treated, Tempered and Cold Drawn.

TIN PLATES: Black, and Tinned Plates, Stamping Stock, and Sheets of every description.

BAR IRON: Refined Bar Iron, Double Refined, Chain, Staybolt, Special Staybolt, and Engine Bolt Iron.

BOLTS: All Kinds, Plain and Galvanized, Machine, Carriage, Lag, Plow and Patch; HEAT TREATED, Simple Alloy Mayari Steel Frog, Track and Fitting-up Bolts.

NUTS: Hot and Cold Pressed, Cold Punched, and Forged, all Sizes, Shapes and Standards, Blank and Tapped, Chamfered, Trimmed and Reamed, Case Hardened, Castle, Semi-Finished and Finished.

RIVETS: Boiler, Bridge, Structural, Ship, Tank and Tap.

SPIKES: Steel and Iron, Standard Railroad, Screw Railroad Track, Universal Screw, Boat, Dock and Wharf, Pressed and Rolled.

ENGINEERS AND BUILDERS OF SPECIAL MACHINERY.
FORGINGS and CASTINGS FOR LARGE MARINE ENGINES.
Hydraulic Beam and Gap Shears, Plate Bending Rolls, Intensifiers, Flanging and Forging Presses.
FURNACE and FOUNDRY COKE and COKE BY-PRODUCTS.
Ammonium Sulphate, Benzol, Crude Napthaline, Solvent Naphthas, Toluol, Tar.
PUMPING ENGINES FOR MUNICIPAL PURPOSES, GAS ENGINES.
NAVAL and COAST DEFENCE GUNS and MOUNTS, FIELD GUNS and HOWITZERS
GUN CARRIAGES, LIMBERS and CAISSONS, GUN FORGINGS, TORPEDO AIR FLASKS, ARMOR PLATE, PROJECTILES, FUSES, CARTRIDGE CASES, COMPLETE ROUNDS OF AMMUNITION.

WORKS AT:

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WAREHOUSES AT:

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GENERAL OFFICES: South Bethlehem, Pennsylvania

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CLEVELAND, O., - - Guardian Building
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PHILADELPHIA, PA., - - - Morris Building
PITTSBURGH, PA., - First Nat'l Bank Building
ST. LOUIS, MO., - Boatmen's Bank Building
SAN FRANCISCO, CAL., - Crocker Building
WASHINGTON, D. C., - - Wilkins Building
Rio De Janeiro, - - - - - BRAZIL
Lima, - - - - - - - - - PERU

TONCAN METAL

Resists Corrosion

THE maintenance expense of the Edgewater Beach Hotel, Chicago, will be reduced because all of the window frames, fire-doors, skylights, eavestrough, conductor pipe and, in fact, all the exposed sheet metal work is made of Toncan Metal Sheets.

The ravages of corrosion hold no terrors for Toncan Metal Sheets and as a result, it means a great saving in repair bills to the building owner. Moreover, its first cost is moderate.

Nearly 100% pure, very dense and homogeneous, Toncan Metal Sheets will resist corrosive influences that a good quality steel or iron sheet cannot withstand. Toncan Metal is made black, painted, or galvanized, and is procurable in the flat sheet or various fabricated forms.

Write for "Corrosion—The Cause—The Effect—The Remedy"

The Stark Rolling Mill Company

Canton, Ohio

Sole Makers

Say you saw it in THE IRON TRADE REVIEW

AMERICAN STEEL CO.

Makers of

TIN PLATE

and

WIRE NAILS

(COATED WIRE NAILS)

TIN MILL AT WAYNESBURG, PA.

WIRE MILL AT ELLWOOD CITY, PA.

PROMPT SHIPMENTS

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AMERICAN STEEL CO.

Park Building - - PITTSBURGH, PA.

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YOUNGSTOWN, OHIO

Y STEEL BRAND PIPE STAR IRON BRAND

THE YOUNGSTOWN SHEET AND TUBE COMPANY NEW PROCESS PATENTED YOUNGSTOWN, OHIO GALVANIZED SHEETS

It has been our privilege during the past year to serve the government effectively and to take care of the needs of our customers to an extent that would have been impossible without large extensions fortunately coming into service at a time when they were most urgently needed. Other extensions approaching completion will still further increase our facilities during the year to come.

In closing a period of unexampled progress in our own business, we desire to extend to our friends and customers everywhere sincere wishes for their happiness and prosperity during the New Year.

DOUBLE REFINED PUDDLED IRON ROOFING

DISTRICT SALES OFFICES

NEW YORK CITY — PHILADELPHIA, PA.
BOSTON, MASS. — CHICAGO, ILL.
PITTSBURG, PA. — DENVER, COLO.
DALLAS, TEX. — SAN FRANCISCO, CAL.
ST. LOUIS, MO. — SEATTLE, WASH.
ATLANTA, GA.

BUCKEYE FENCE

The work on our new Tin Plate Mills is rapidly progressing. By March first, we will be making regular shipments.

If you are a user of Tin Plate, it will profit you to send us your orders—because our Mill is being specially constructed and equipped to produce *highest quality;* and our new products will be carefully selected.

"Liberty" Tin Plate assures successful products.

The Liberty Steel Co.

WARREN, OHIO

Say you saw it in THE IRON TRADE REVIEW

·Sheet Bars·
Blooms·Billets

Let us fill your requirements with **"Republic"** Quality—and then you can watch your results improve. Prompt and accurate service assured.

Bessemer **STEEL** **Open Hearth**

Merchant Bars **Sheet Bars** **Pig Iron** **Billets**
Blooms **Slabs** **Skelp** **Bar Iron**
Old Rail Bars **Round Polished Steel Shafting**

SHEARED PLATES
BOILER FLANGE TANK

Railroad Spikes Boat Spikes Turnbuckles Nuts Washers Bolts

"Republic" Pipe

STANDARD BLACK GALVANIZED

Line Pipe **Drive Pipe** **Tubing and Casing**

If you are not using "Republic" Quality, we are anxious to prove to you its real value.

Republic Iron & Steel Co.

General Offices: Republic Bldg., Youngstown, O.

SALES OFFICES:

BIRMINGHAM BUFFALO CINCINNATI DALLAS NEW YORK PITTSBURG
BOSTON CHICAGO CLEVELAND DETROIT PHILADELPHIA ST. LOUIS
SAN FRANCISCO

Say you saw it in THE IRON TRADE REVIEW

Make your tools of "ELECTRITE" if you wish *SPEED*

There's a quality of *toughness, durability* and *strength* to "Electrite" that is foreign to most high speed steels This is because "Electrite", a high quality electric furnace steel, is alloyed with Uranium.

Uranium gives "Electrite" the power to resist crystalization and to stand up under unusual shocks and strains of service.

"Electrite" Uranium has relieved the pressure on the production schedule of a great many other plants by turning out more work per tool and more work per hour.

Speed up *your* production by making your tools of "Electrite"—the steel that takes the big cuts and the quick cuts. Sample free.

Latrobe Electric Steel Company
LATROBE, PENNSYLVANIA

SALES OFFICES:

*165 Broadway . . . . . New York	Conover Building . . . . . Dayton
Washington & Green Sts. . . . . Chicago	Commercial Trust Bldg. . . . Philadelphia
40 Central Street . . . . . Boston	514 No. 3rd St. . . . . St. Louis
2802 Union Central Bldg. . . . . Cincinnati	405 American Bank Bldg. . Los Angeles, Calif.
Box 765 . . . . . Buffalo, N. Y.	149 California St. . . . . San Francisco
First National Bldg. . . . . Pittsburgh	536 1st Ave. South . . . . . Seattle, Wash.
664 Spitzer Bldg. . . . . Toledo	1001 Ford Building . . . . . Detroit
2230-2240 E. Ninth St. . . . . Cleveland	Oppenheim Building . . . . . St. Paul

*All export business handled from New York Office.

"ELECTRITE" URANIUM HIGH SPEED STEEL

Steel for Service

1—W.H. 68 Solid Gear, 66 teeth, machine cut steel casting, 3⅞" bore.
51—W H 12 Solid Gears, 68 teeth, 3⅞" bore, machined from Carnegie rolled blanks.
1—G.E. 67-1000 Solid Gear, 69 teeth, 4" bore, machine cut from steel casting.
2—G.E. 70-80-90 Solid Gears, 69 teeth, 5½" bore, machine cut from steel castings.
2—G.E. 70-80-90 Solid Gears, 69 teeth, 5½" bore, standard grade, untreated.
2—G.E. 70-80-90 Solid Gears, 69 teeth, 5½" bore, case hardened.
9—G.E. 67-1000 Solid Gears, 67 teeth, 4½" bore, oil treated, machined from Carnegie rolled blanks.

Extract from an advertisement of a dealer in gears

Carnegie products are distinctive. They stand out from among their fellows and require something more than the usual description properly to classify them.

Carnegie service is inwrought in all Carnegie products. Careful selection of materials, skill in manufacture and attention to the minor details of design mean satisfaction to the user and ultimate economy in expenditure.

This distinctiveness marks gears machined from

Carnegie Rolled Blanks

If you desire the maximum of service and satisfaction, do not fail to specify them on your orders. Full information is given in the pamphlet entitled Gear Blanks and Miscellaneous Circular Sections which can be obtained from any district office.

The mark of quality

It protects the user

Carnegie Steel Company

General Offices: Pittsburgh, Pa.

931

Wire Products

The latest addition to the Interstate organization is the plant at Grand Crossing, Illinois, formerly the Grand Crossing Tack Company.

This is our plant for the making of wire. It completes our facilities for the manufacture of wire and wire products —from pig iron to the finished articles.

Well-posted buyers have known of the really remarkable quality of the Grand Crossing product. Now, under Interstate ownership and management, that high quality is not only being maintained but more modern machinery and methods are raising the quality to an even higher level.

Grand Crossing output includes wire rods, fencing, nails, staples, tacks, rivets, burrs, washers, and other forms of wire products.

Interstate Iron and Steel Co.

Grand Crossing
Illinois

JUST OFF THE PRESS

If you are interested in concrete reinforcing bars you should have a copy of this new, illustrated pamphlet which can be had for the asking from our nearest district office.

Midvale Steel and Ordnance Company
Cambria Steel Company

General Sales Offices: Widener Building, Philadelphia, Pa.

DISTRICT SALES OFFICES:

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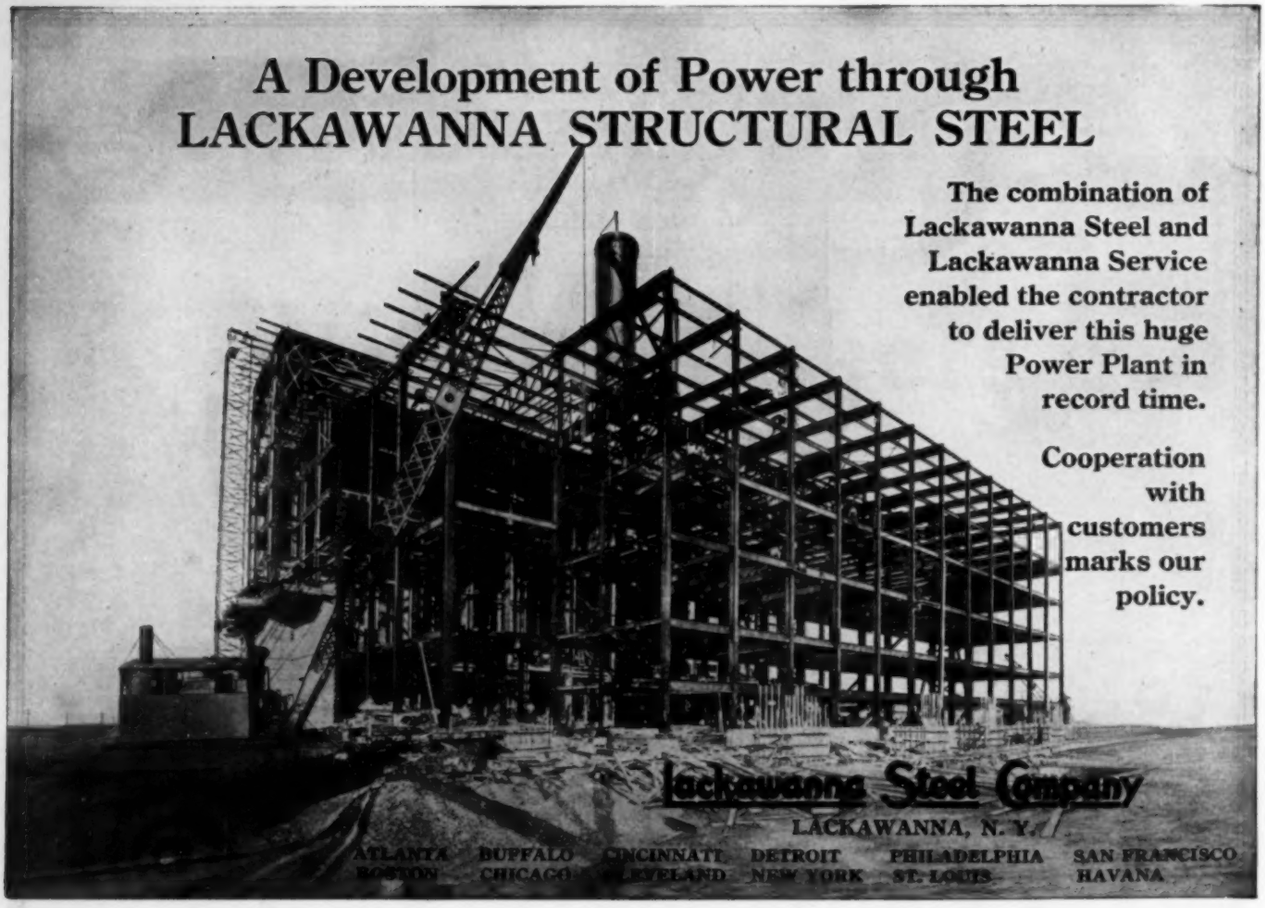
Boston	Cincinnati	Detroit	Philadelphia	Salt Lake City	Seattle
			St. Louis		

"We Want You To Become Better Acquainted With Us" Series. Number 35.

A Development of Power through LACKAWANNA STRUCTURAL STEEL



The combination of Lackawanna Steel and Lackawanna Service enabled the contractor to deliver this huge Power Plant in record time.

Cooperation with customers marks our policy.

Lackawanna Steel Company
LACKAWANNA, N. Y.

ATLANTA BOSTON BUFFALO CHICAGO CINCINNATI CLEVELAND DETROIT NEW YORK PHILADELPHIA ST. LOUIS SAN FRANCISCO HAVANA

Scully Service

We ship immediately from Chicago stock

Boiler, Tank and Universal Plates—Beams—Channels—Angles—Tees—Steel and Iron Bars—Norway Iron—Staybolt Iron—Tire Steel—Shafting—Concrete Bars—Hoops—Band Steel—Black and Galvanized Sheets—Blue Annealed and Corrugated Sheets—Keystone Sheets (Weather Resisting)—Steel and Iron Boiler Tubes—Seamless Tubes—Boiler and Structural Rivets—Machine and Carriage Bolts—Lag Screws—Bolt Ends—Boiler-patch and Stay-bolts—Nuts—Washers—Hand and Power Machinery—Flanges—Ferrules—Expanders—Valves—Flue Cleaners—Anvils—Vises—Forges—Blowers—Turnbuckles—Boiler Lugs, etc.

Scully Steel & Iron Co.
Chicago, Ill.

Down Town Office: Suite 1127 New Continental and Commercial Bank Building

NEW YORK MILWAUKEE MINNEAPOLIS DENVER SALT LAKE CITY LOS ANGELES COLUMBUS

The Best The Market Affords In

Billets, Slabs,
Sheet Bars,
Blue Annealed Sheets,
Black and Galvanized Sheets
and
Formed Roofings

Address all communications to our Wheeling Sales Office

Members of National Association of Sheet and Tin Plate Manufacturers.

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Wheeling, W. Va.

The Automobile Designer

Has Found

VANADIUM STEEL

Indispensable For
The Light Car

The Airplane Designer

Will Find it Equally
Indispensable
For the Airplane
where
Maximum Strength
with
Minimum Weight
is Vital

American Vanadium Company

New York Pittsburgh London

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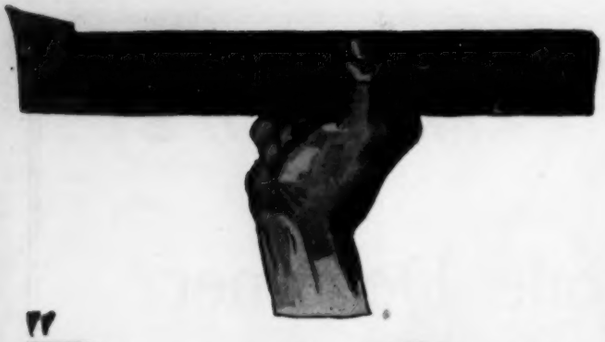

"Red Cut Superior"

HIGH SPEED STEEL

YOU have thought of many qualities you would like to have in High Speed Steel Tools—such as cutting edges with long life, freedom from brittleness, great reserve strength and toughness to resist shocks and strains, tools that would not require special heat treatment, tools that would take deep roughing cuts or fine smooth finishing cuts, and in addition, could be worked at higher speeds than you ever dreamed of. All these virtues and many more are contained in "Red Cut Superior", a First Quality High Speed Steel. Furnished in Annealed Bar Stock, Discs, and Treated Tool Holder Bits.

Are your tools made of Red Cut?

Send for folder

VANADIUM-ALLOYS STEEL COMPANY

Pittsburgh, Pa.

Works at Latrobe, Pa.

JONES & LAUGHLIN STEEL COMPANY

Manufacturers of

VARIOUS STEEL PRODUCTS

Branch Offices:

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General Offices:

Jones & Laughlin Building

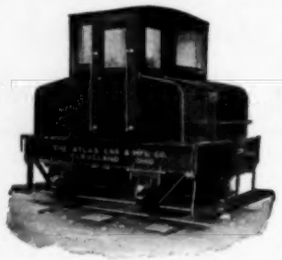
PITTSBURGH

122

QUICK SERVICE

For Switch Yards and Steel Mills

No. 5625 STORAGE BATTERY LOCO-MOTIVE



Designed Especially for Moving Rolling Stock

Made in several sizes to suit requirements.

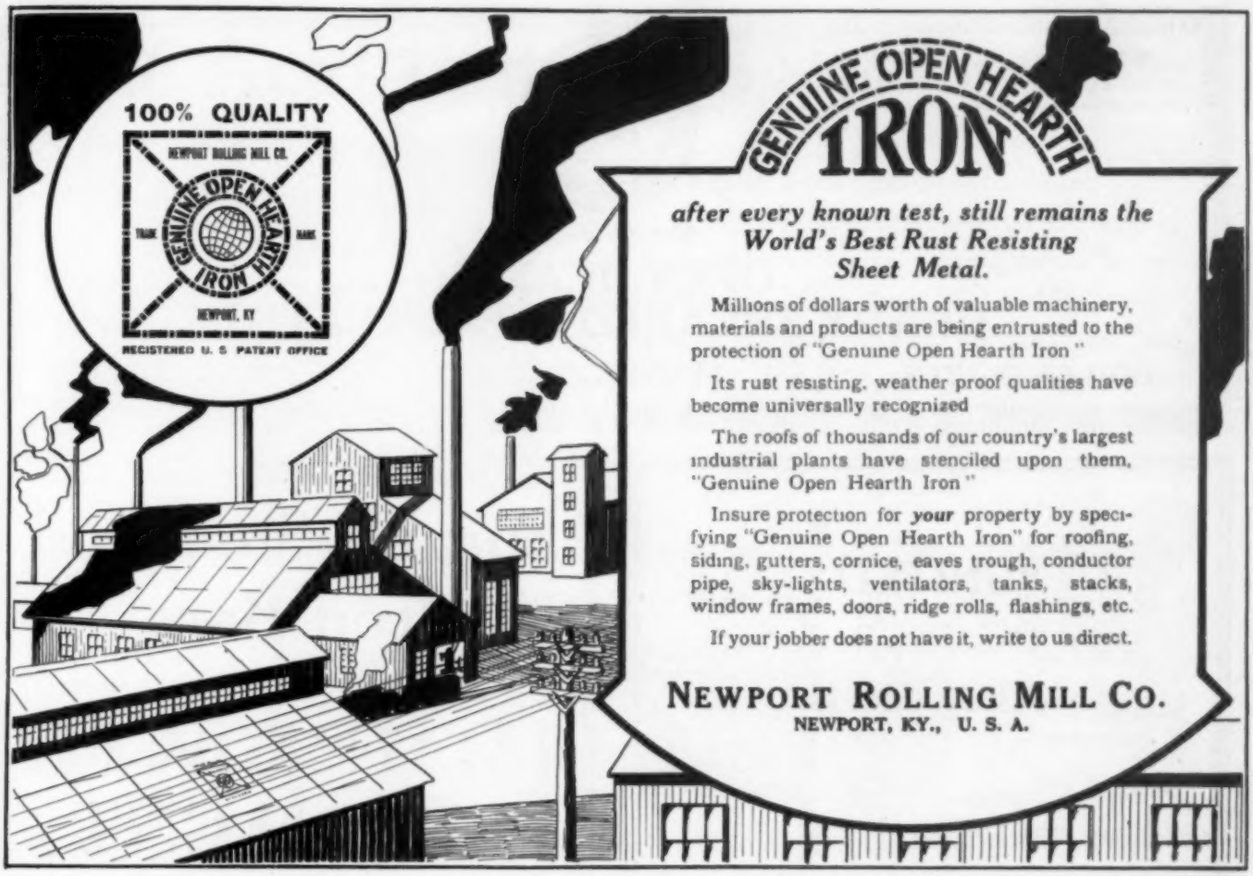
If you own an *"Atlas" Storage Battery Locomotive* you won't have to wait until the railroad gets ready to do your switching. You can switch just *what* you wish, just *when* you wish. This will mean a great deal of time and convenience to you.

Any employe of ordinary intelligence can run this locomotive. All parts are easily accessible for oiling, adjustment and repair.

If you are interested in saving money, send for our catalog and read about our entire line of Storage Battery Locomotive Cranes and Cars.

The Atlas Car & Manufacturing Co.

1200 Marquette Rd. Dept. E. Cleveland, Ohio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NEWPORT ROLLING MILL CO.
GENUINE OPEN HEARTH
IRON
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REGISTERED U. S. PATENT OFFICE
GENUINE OPEN HEARTH
IRON
after every known test, still remains the World's Best Rust Resisting Sheet Metal.
Millions of dollars worth of valuable machinery, materials and products are being entrusted to the protection of "Genuine Open Hearth Iron"
Its rust resisting, weather proof qualities have become universally recognized
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Insure protection for your property by specifying "Genuine Open Hearth Iron" for roofing, siding, gutters, cornice, eaves trough, conductor pipe, sky-lights, ventilators, tanks, stacks, window frames, doors, ridge rolls, flashings, etc.
If your jobber does not have it, write to us direct.
NEWPORT ROLLING MILL CO.
NEWPORT, KY., U. S. A.

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SPECIAL ALLOY STEEL

CHROME -:- NICKEL
CHROME VANADIUM
CHROME NICKEL
and

Special Steel for All Purposes

PROMPT SHIPMENT FROM STOCK
WRITE FOR MONTHLY STOCK LIST

The Andrews Steel Company
INCORPORATED.

NEWPORT, KY., U. S. A.

DISTRICT SALES OFFICES
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NEW YORK BOSTON DALLAS SAN FRANCISCO

ALAN WOOD IRON & STEEL CO. ESTABLISHED 1826 "A.W." TRADE MARK PHILADELPHIA

Manufacturers of

OPEN HEARTH
HEAVY SHEARED STEEL PLATES

BOILER PLATES **FLANGE PLATES** **TANK PLATES**

"UNITED"

Open Hearth and Electric

Alloy Steels

Making alloy steels is our *business*.

The purchaser of "United" Alloy steels benefits not only through our long experience but also through our constant progress.

United Alloy Steel Corporation
Canton, Ohio

Surplus Steel and Iron Bars

for

IMMEDIATE SHIPMENT

also

CHAINS

Hooks, Shackles, Eye-Bolts and Various

DROP FORGED

attachments carried in stock in a large variety of sizes.

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JAMES McKAY CO.
PITTSBURGH, PA.

STRUCTURAL MATERIAL - COMPLETE STOCK
PROMPT SHIPMENT

Special Rollings—4" Beams, 4" Channels and Narrow Plates

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ECONOMICAL DESIGNS FOR STEEL BUILDINGS - FABRICATION - ERECTION

N. Y. Office
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Main Offices and Works:
PHILADELPHIA, PA.

Bridge Shops
EDDYSTONE, PA.

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The Acid Test for any product is service

PUDDLING PROCESS

Time is a great leveler and shows us many imperfections; also teaches us that some of the old ways of doing things not only have not but cannot be improved upon. We still continue to make *IRON* by the *old fashioned puddling process*, because Time has taught us that this gives us a product superior for the purposes for which Iron is especially adapted and absolutely necessary.

Above is shown the first stage in making the finished bar of VULCAN PUDDLED IRON.

We make the grade to suit the purpose.

REFINED
VULCAN
VULCAN SPECIAL
VULCAN XX

For Ordinary Uses
For Special Purposes
For Engine Bolts
For Locomotive Staybolts

Send for our booklet "Facts"

Positively—

KEYSTONE COPPER STEEL

To understand why the copper-steel alloy gives longer life to sheet metal products, it is only necessary to inaugurate a few simple service tests of your own—that is, if you will not accept our exhaustive and definite proofs. You will ultimately convince yourself of the excellence of KEYSTONE Copper Steel.

American Sheet and Tin Plate Company

General Offices: Frick Building, Pittsburgh, Pa.

DISTRICT SALES OFFICES:

Chicago Cincinnati Denver Detroit New Orleans New York Philadelphia Pittsburgh St. Louis

Export Representatives: United States Steel Products Company, New York City

Pacific Coast Representatives: United States Steel Products Company, San Francisco, Los Angeles, Portland, Seattle

MAKE NAILS!—NOT NOISE!!

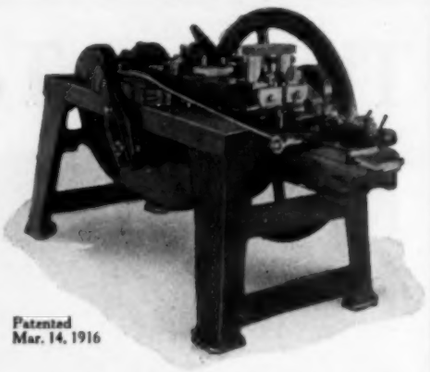
We offer the trade something new in

WIRE NAIL MACHINES

QUIET IN OPERATION
WITH VERY HIGH OUTPUT
GREAT CAPACITY
OCCUPYING SMALL FLOOR SPACE
WITH ALL PARTS ACCESSIBLE
DECREASED MAINTENANCE COSTS

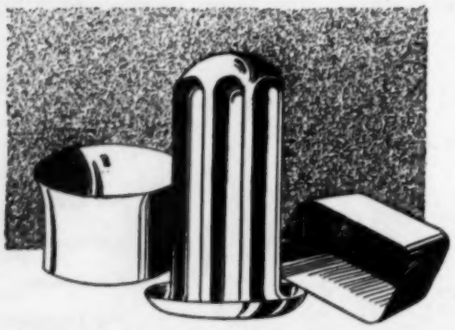
Smoothly running machines, with balanced mechanical motions and no rotating cams. Built in five sizes, handling wire from No. 17 to 3/8" diam.

PRACTICALLY NOISELESS IN OPERATION



Patented Mar. 14, 1916

SLEEPER & HARTLEY, Inc.
WORCESTER, MASS. CANADIAN BRANCH, COATICOOK, P. Q.



For difficult drawing and stamping

SUPERIOR
HOT AND COLD ROLLED
STRIP STEEL

Made in any degree of softness or hardness required.
Extra fine finish for plating.
Uniform in quality. Accurate to gauge.

SUPERIOR STEEL CORPORATION
Union Arcade Building, Pittsburgh, Pa.
Mills at CARNEGIE, PA.

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E. R. HENSEL STEEL & COPPER CO., Security Building, St. Louis, Mo.
GEORGE W. HOUSE, Ford Bldg., Detroit, Mich.

Better Service
than ever before—

Right now, when you need it MOST, we are in a position to take care of your steel requirements. Our new, large warehouse enables us to do this.

Let us know when you need

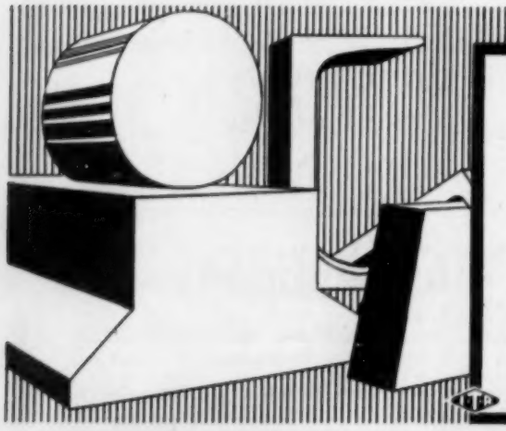
STEEL

The following we carry in stock:

High Speed Steel; Tool Holder Steel; Oil Hardening Steel; Vanadium Steel; Chrome and Nickel Steels; Annealed Punch and Die Steels; Tool and Drill Steels; Pick, Wedge and Hammer Steels; Spring and Machinery Steels; Annealed Cutter Blanks; Drill Rods; Music Wire for Springs; Tempered Spring Wire; Cold Rolled and Drawn Steels; Forgings; Specialties, Iron.

ABORN STEEL COMPANY, Inc.
22 Clarke St., New York City

BRANCHES:
Philadelphia, Pa. 269 Drexel Building
Rochester, N. Y. 133 Andrews Street



UNION DRAWN SERVICE AND QUALITY

is real service and quality because not a single detail has been overlooked in building this unique organization. We have warehouses in five large cities always stocked and ready to serve you with anything in Bessemer, Openhearth, Nickle, Chrome and Vanadium Steel, Cold Drawn Shafting, Elevator Guides, Screw Stock, Rounds, Flats, Squares and Hexagons.

UNION DRAWN STEEL CO. Main Office **BEAVER FALLS, PA.**
WORKS: Beaver Falls, Pa. and Gary, Ind.
Offices and Warehouses—New York, 460-466 Washington St., Philadelphia, Ninth and Willow Sts. Cincinnati, Spring Grove Ave. Chicago, 570 West Adams St. Detroit, 69 Jos. Campau Ave. Boston, 95 Milk St. Buffalo, White Building.

CENTURION SUPERIOR

THE GUARANTEED 18% MINIMUM TUNGSTEN CONTENT

AND

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THE GUARANTEED 15% MINIMUM TUNGSTEN CONTENT

STRICTLY CRUCIBLE HIGH-SPEED STEELS

QUALITY—DELIVERY—SERVICE

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PLATES, U. M. Sheared and Checkered
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FLATS, Mild, Forging and Cold Drawn Screw Stock
BANDS, Scrolled and Straight Lengths
HEXAGONS, Cold Drawn Screw Stock
SHEETS, Blue Annealed and American Bessemer
SHEET PILING, U. S. Steel
BARK RACK BARS, Double Bevel
RAILS, Heavy and Light
RAIL FITTINGS, Splices, Track Bolts and Spikes
FORGING BILLETS
RIVETS, Structural, Cone Head, Countersunk and Draw Bar Yoke
BOLTS, Machine, Bolt and Rod Blanks

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Deep Drawing and Extra Deep Drawing Auto Body Stock. Deep Drawing and Extra Deep Drawing Crown Fender Stock. Hood Stock.

Prompt Service

The Mansfield Sheet & Tin Plate Company

MANSFIELD, OHIO

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STEEL PLATES and SHEETS

Principal Offices
POTTSTOWN, PA.

WORKS

Plate Mills - - - Pottstown, Penna.
Sheet Mills - - - - Seyfert, Penna.
Open Hearth Steel Furnaces - Rahway, N. J.

Seneca Brand Stands for Quality

STEEL SHEETS

in gauges Nos. 14-30. Not over 40" wide

BLACK
GALVANIZED
CORRUGATED
and
FORMED ROOFING

Seneca Iron & Steel Co.
Buffalo, N. Y.

QUALITY

We use only the highest grade material in the manufacture of

ERDLE
Perforated Metals

We are perforators of **Aluminum, Brass, Copper, Steel, Tin, Zinc, Etc.,** for threshing machines, fanning mills, pulp machinery, electrical devices, ventilators, grilles, coal and mining screens of all descriptions, and for hundreds of other purposes.

ERDLE PERFORATING CO.

ROCHESTER, N. Y.

New Fire Proof Plant, Childs St. and B., R. & P. Ry.

SERVICE

Our large stock of sheet metals enables us to fill your orders **promptly** and at a **minimum** cost.

ERDLE
Perforated Metals
are the result of over half a century's experience.

We guarantee to satisfactorily fill any specified requirements. Our service will prove valuable to you. **Ask us for a Metal Sample Plate.**

We manufacture Perforated Steel for Machinery Guards and also carry a stock of Perforated Steel.

Say you saw it in THE IRON TRADE REVIEW

TRUMBULL

Coke Tin Plate

Open Hearth
Ingots, Blooms,
Billets, Slabs,
Sheet Bars

Black and Galvanized Sheet Steel

Galvanized and Painted Formed Products

Hot and Cold Rolled Strip Steel

THE TRUMBULL STEEL COMPANY

General Office:
Warren, - Ohio

STRIP STEEL

ROLLED TO SUIT THE PRODUCT

A long step forward in heating and rolling equipment makes possible a new and better quality of strip steel rolled to suit the requirements of any product which can be manufactured from strips up to 24" wide, gauges 16 to 00 inclusive, Standard or Alloy Steel.

Prompt Shipments

Write for Quotations

We Specialize in Rolling
Chrome Nickle
Chrome
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Special Analyses

THE NATIONAL PRESSED STEEL CO.
Rollers of Strip Steel
MASSILLON, OHIO
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PORT CHESTER, NEW YORK

ESTABLISHED 1845

Makers of The Celebrated **EMPIRE** BOLTS and NUTS

Western Office: Continental & Commercial Bank Building, Chicago, Ill.

Branch Works: Rock Falls, Ill.

Machine, Carriage, Track and Bridge Bolts.

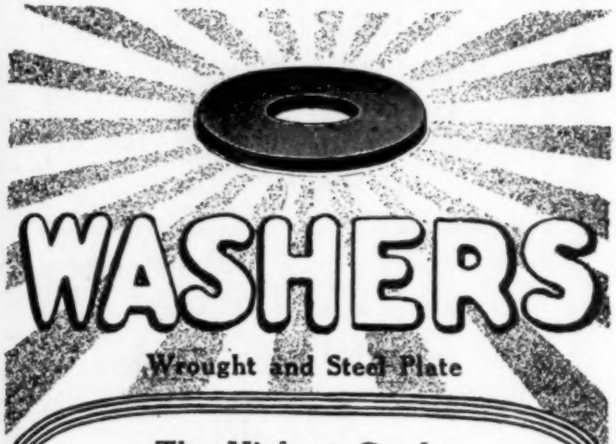
BOLTS

Pole Line Material and Wagon Irons, Picks, Mattocks, Grub Hoes, Crow Bars, Wedges, etc.

OLIVER IRON & STEEL CO.

ESTABLISHED 1863

PITTSBURGH, PA.



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Wrought and Steel Plate

The Highest Grade, of All Descriptions.

Standard sizes shipped promptly. *Special* sizes on short notice. Also

Annealed Rivet Burrs Felloe Plates, Etc.

Let us know your requirements. We guarantee Quality and Service.

Wrought Washer Mfg. Co.

MILWAUKEE, WIS.

Screws—Rivets—Studs

Sink Bolts, Closet Screws, Complete Line of Machine Screws Boxed for the Hardware Trade. Threaded Wires.

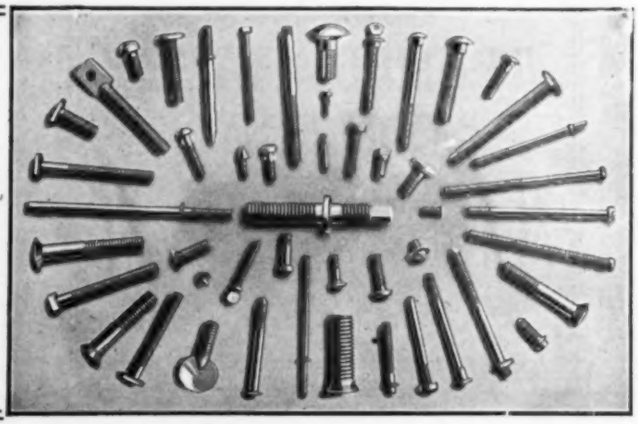
Each article illustrated was made for discriminating customers who demand something better than the usual kind. Our process enables us to make many articles that are now made on screw machines. We make them **just as good, much quicker and MUCH cheaper.**

Estimates gladly furnished *State quantity and submit samples*

Catalog mailed upon request

The Progressive Mfg. Co.

Screw and Rivet Specialists TORRINGTON, CONN.



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CANNOT LEAK
CANNOT RUST
CANNOT BREAK

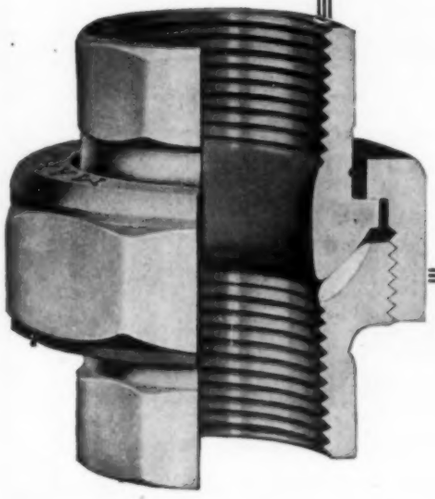
For Reliability and Economy

MARK UNIONS

have no rival. They will not break, stretch, leak or rust. They will thoroughly insure you against all union troubles. They are drawn cold from rolled steel, and the Brass Seat is welded in—it cannot come loose.

We'll be glad to send you a sample

THE MARK
Cold Drawn Steel Union

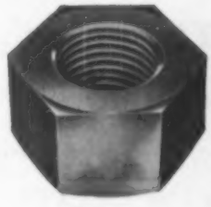


MARK MFG. CO.

Makers of Standard Full Weight Steam, Water, Gas and Line Pipe, Black and Galvanized

1907 DEMPSTER ST. EVANSTON, ILLINOIS

NUTS



"Milton" Semi-Finished

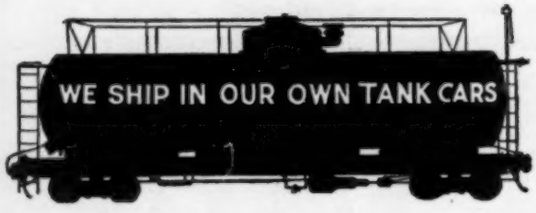
Being faced at right angle with thread supplies a tight contact surface against the machine. All sizes.

THE MILTON MFG. CO.
MILTON, PA.

12

Protect yourself against gas and coal shortage

CLARENDON FUEL OIL



Last year hundreds of plants closed down on account of gas shortage.

This year hundreds will close down on account of coal shortage.

Protect your plant against shut-downs by using ***Clarendon*** Oil for fuel. It fulfils every requirement and has already been adopted by many large steel plants.

The short haul in our own tank cars minimizes the chances of car shortage and other railroad delays.

Comparative tests show ***Clarendon Fuel Oil*** to be much superior to coal or Mexican Oils.

Clarendon Fuel Oil	22,000 B. T. U.
Mexican Oil	19,000 B. T. U.
Coal - -	12,000 B. T. U.

Let us tell you more about it.

CLARENDON REFINING CO.
423 Oliver Bldg.
PITTSBURGH, PA.
Refineries: Clarendon, Pa.

The Matthew Addy Company

FOUNDED 1859 ADDY INCORPORATED 1915

Write our nearest office

CINCINNATI PHILADELPHIA
ST. LOUIS CHICAGO

Old Eliphaz the Temanite told Job "Man is born unto trouble as the sparks fly upward". We are not having just the same kind of trouble that Job had, but we are having another variety with delayed shipments, bad Railroad service, etc., etc., etc. Had Eliphaz, the Pessimist, lived now, he would have expressed himself in a good deal more vigorous manner, although possibly it would not have been quite so poetic.

PIG IRON COKE COAL

Edmund W. Mudge & Company

Frick Building PITTSBURGH, PA.

STANDARD BASIC AND BESSEMER PIG IRON

BASIC OPEN HEARTH AND BESSEMER STEEL BILLETS SLABS AND SHEET BARS

FURNACE AND FOUNDRY COKE, COAL FOR BY-PRODUCT AND PRODUCER GAS USERS

Own and Operate

CLAIRE FURNACE COMPANY
Sharpsville, Pa.
ELLA FURNACE COMPANY
West Middlesex, Pa.
WESTMORELAND CONNELLSVILLE COAL & COKE COMPANY
RELIANCE COKE COMPANY

Say you saw it in THE IRON TRADE REVIEW

10-ton LUDLUM pouring

THE LUDLUM ELECTRIC FURNACE

For Making Tool and Alloy Steels, Cast Iron and Cast Steel, Pig Iron, Wash Metal and Smelting of Ores

Regarding Making of Cast Iron:

Two 5-Ton Ludlum Furnaces operated by the Sweetser-Bainbridge Metal Alloy Corporation are now making high grade cast iron more cheaply than inferior grades can be made by the Cupola Process.

Tests performed by Columbia University on two specimens of this Electric Cast Iron, show results as follows:

Test Sheet	Analysis No. 1	Analysis No. 2
Total Carbon	3.26	3.40
Graphitic	2.54	2.67
Combined	0.72	0.73
Silica	1.50	1.91
Manganese	0.41	0.42
Phosphorus	0.020	0.022
Sulphur	0.012	0.010

RESULTS OF TESTS	No. 1	No. 2
Tensile Strength lbs. per sq. in.	45,030*	40,730*
Modulus of Rupture lbs. per sq. in.	71,440	71,500

Fracture in every case fine, granular.

*Tension tests were made in rough, square bars instead of machine turned, round bars as is customary. The latter method would have shown strengths from 10% to 40% greater.

Further data as to what Ludlum Furnaces are doing, or an opportunity to witness these furnaces in operation, should be of interest to you.

Ludlum Electric Furnace Corporation

Woolworth Building
NEW YORK CITY

The Holbeck Pulverized Coal System

will shortly be delivering

One Million Pounds of Pulverized Coal Per Hour

to

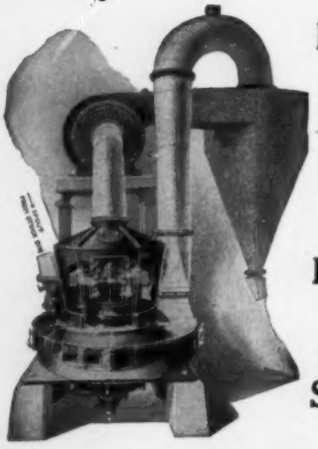
Over 1200 Furnaces

Including Annealing, Bushelling, Continuous Billet, Bloom Heating, Converters, Drop Forge, Galvanizing Pots, Ingot, Puddling, Plate Heating, Reverberatory, Sheet and Pair, Spring Furnaces and Tin Pots.

Our Engineers will be glad to figure on your Requirements.

Write for Catalog and List of Plants

THE BONNOT CO. Canton, Ohio



For Pulverizing Your Coal

investigate the use of a

RAYMOND
Pulverizing Air-Separating
SYSTEM

We think you will come to the same conclusion as one of our prospective customers who writes as follows:

"In our study of this subject, thus far, we find that there is a general concensus of opinion amongst a great many who are using pulverized fuel to the effect that your apparatus is quite satisfactory in every respect."

What more can we say except "Ask for quotations"?

Raymond Bros. Impact Pulverizer Co.
1313 North Branch St., Chicago, Ill.

HIGH ON SPEED
TRADE MARK

Real Steel Economy

To avoid waste is to economize. Send your High-Speed Steel scrap to us—we will reclaim it and send it back to you in the shape of Bars, with quality good as or better than the original.

ONONDAGA STEEL COMPANY
-INCORPORATED-
SYRACUSE, NEW YORK

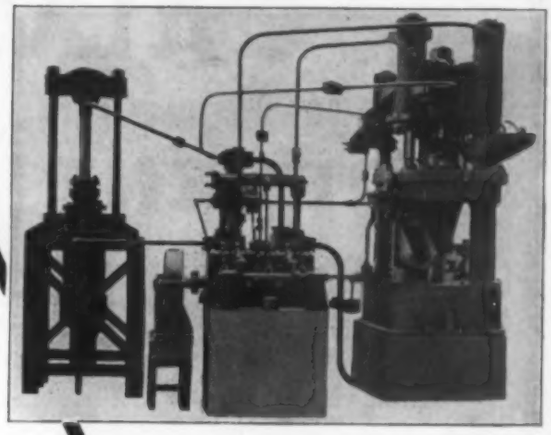
Scrap Pile Talk

SUPPOSE
YOU HAD a lot
OF CHIPS and turnings
AND LIGHT scrap
AND IT bothered you
BECAUSE you know
MIGHTY well
THAT IF you melt it
YOU'LL HAVE big losses
AND IF YOU sell it
THE PRICE will be
A JOKE without a
LAUGH. And then

SUPPOSE you sent
A BARREL or so
TO US, to see
WHAT WE could do.

SUPPOSE we made
BRIQUETTES of that
LIGHT SCRAP, and sent the
BRIQUETTES back
TO YOU. And then
YOU PUT the briquettes into
CRUCIBLES or cupolas or
OPEN HEARTHS or electric
FURNACES or whatever
YOU MELT in. And
SIDE by side you
RAN THE LIGHT scrap
AND FOUND that the
BRIQUETTES melted down
WHILE THE scrap mixture
WAS GETTING started; and
that the
BRIQUETTES showed
A LOT MORE METAL after the
MELTING than did the
LIGHT SCRAP mixture,
altho they
STARTED EVEN. And when
you
FIGURED that
BRIQUETTES so used
SAVE THOUSANDS of dollars,
YOU'D probably ask us
TO QUOTE on a
RONAY PRESS suited to
YOUR CAPACITY.
WOULDN'T YOU?

This ad talks mostly about metal—but if you are interested in fuel or ore briquetting we know something about that too.



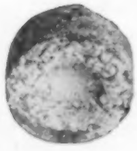
This is our A Press. It will turn out 2-3 tons per hour, and sometimes more. Saves about $40 per ton for brass and bronze manufacturers, $60-$100 per ton for aluminum manufacturers. It solves the problem of melting cast iron borings and steel turnings.

Steel (chips) Briquettes

Brass Scrap Briquettes

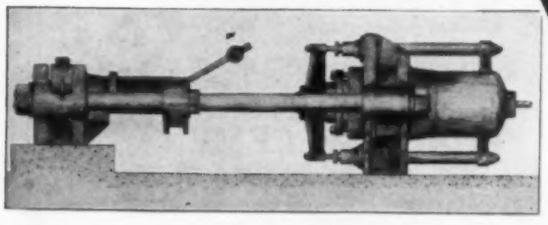
Metal Dross Briquettes

Cast Iron (Borings) Briquettes



Aluminum (light scrap) Briquettes

Copper Briquette



This represents our types B & C Presses. Built for capacities from ¾ ton to 1 ton per hour. Does as much for the metal manufacturers as our A press—illustrated above.

Send for bulletins—They tell the story

THE GENERAL BRIQUETTING COMPANY

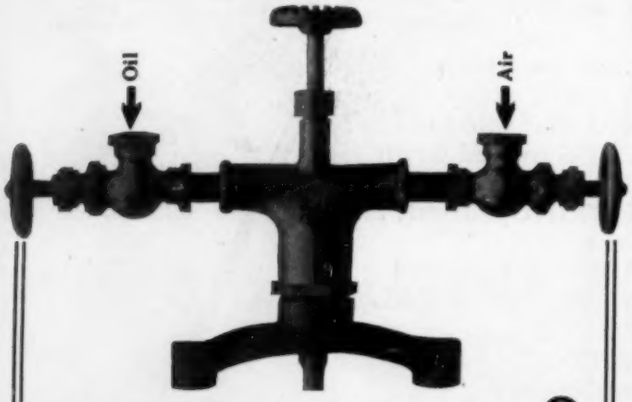
25 Broad St.
NEW YORK

GALVANIZE
TO
PREVENT CORROSION

Zinc applied as coating protects steel or iron against RUST—the Red Fox. Many substitutes for galvanizing, some cheaper, others more expensive, have been and are still offered, but in spite of this steel is always galvanized when positive protection is desired.

We have built and installed hundreds of different types of rust-proofing units for the trade, and can refer you to leading industries—we invite your thorough investigation. Read our booklets mailed on request.

MEAKER GALVANIZING COMPANY
1249 Fulton Street **Chicago, Ill.**



THE BURNING QUESTION ?
Is

How will I keep my furnaces going with no gas to be had and coal hard to get. The only answer is—

McWATTERS
OIL BURNERS

We also make Brass, Bronze, Aluminum and Gray Iron

CASTINGS

Wood and Metal Patterns

Let us bid on your work

LEETSDALE FOUNDRY & MFG. CO. INC.
LEETSDALE, PA. Pittsburgh District.

When Repairs Are Necessary on Furnace or Cupola Linings, Keep in Mind

DIXON'S FURNACE CEMENT
(Crucible Clay and Graphite Mixture)

Its superiority for this class of work has been proven by many years of satisfactory service.

Then, too, it's handy to have around for lining ladles, making tap-hole mixture and similar foundry requirements.

Price and folder No. 64-V on request.

Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE COMPANY

D X N ESTABLISHED 1827 D X N

The Rolling Mill Industry

By F. H. KINDL, Engineer

In this work the author has endeavored to give a condensed, general description of iron and steel rolling mills and their products, without discussing the details of rolling any special material. Essentially, it is a summary of American rolling mill practice, its development being traced from the beginning to the present day.

An effort has been made to define more closely the various mills and their products and the various classifications therein presented have been approved by leading manufacturers and many of the country's foremost iron and steel engineers.

The charts which graphically show the production of semi-finished and finished products, from 2,000 pounds of iron ore, 1,000 pounds of coke and 600 pounds of limestone represent modern practice at some of the largest open-hearth plants and rolling mills. Charts also are included to clearly illustrate the amounts of material charged and produced in making one ton of pig iron; the distribution and production of iron and steel in 1907 and 1911; the conversion of pig iron into the various finished products, etc.

For those interested in the economics of the iron industry, a table has been prepared in which a comparison has been made of the general fundamental factors dictating the production of pig iron in the United States, Germany and Great Britain, with particular reference to the Pittsburgh district of the United States, the Rheinland-Westfalia district of Germany, and the Cleveland district of Great Britain.

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Historical
Classification of Rolling Mills
Finished Products
The Wire Industry
Tube and Pipe Industry
Tin and Terne Plate Industry
Statistical
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Production of Rolled Iron and Steel
Total Production of Finished Rolled Iron and Steel
Production of Cut and Wire Nails
Production of Tin and Terne Plate
Production of Tin and Terne Plate in the United States Since 1891
Iron and Steel Imports and Exports
Basic Factors of Pig Iron Production in the United States, Germany and Great Britain
Summary of Statistics for 1910 and 1911
The World's Leading Iron and Steel Producers
The World's Production of Coal, Coke, Iron Ore, Pig Iron and Steel in 1910
World's Iron and Steel Production, 1850 to 1910.

Bound in cloth, $2 a copy; in full flexible leather, $3 postpaid

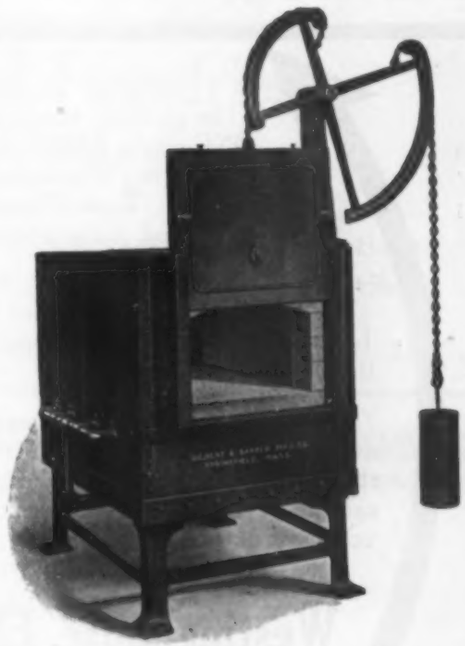
PENTON'S BOOK NEWS
Cleveland, Ohio

307

Do your heat-treating Scientifically

Use

GILBERT & BARKER FURNACES



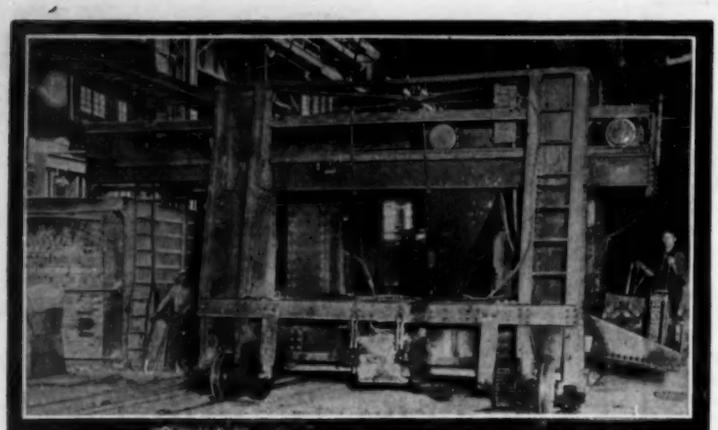
GILBERT & BARKER Furnaces always assure uniform temperature because the fuel control is absolutely accurate.

Built for all purposes from open fire heating to case hardening.

One Hundred standard types.

Write for Catalog 22.

GILBERT & BARKER MFG. CO.,
SPRINGFIELD, MASS.



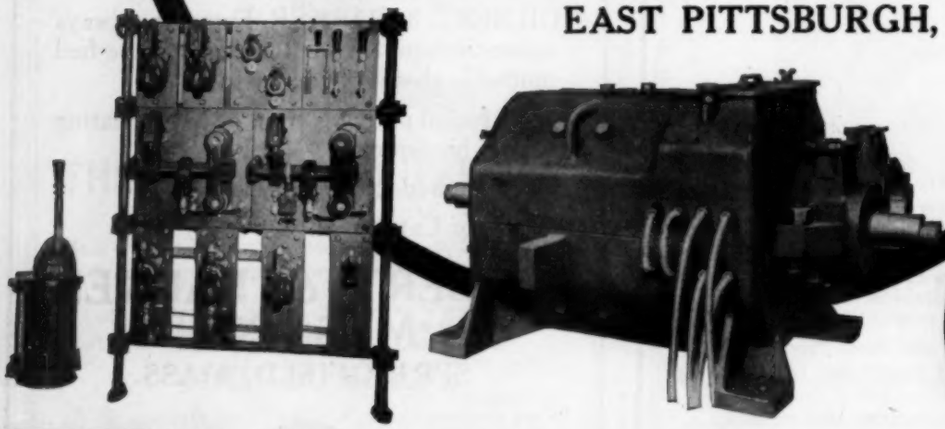
The first Open Hearth Charging Machines were built by Wellman-Seaver-Morgan Co., and installed at the Homestead Steel Works in 1895.

The pictures above show two pioneers of the steel industry—ONE of the FIRST FOUR Open Hearth Charging Machines, and one of the Westinghouse Motors with which these Chargers were equipped. These Chargers are still in operation, and during this twenty-two-year period, have effected a saving of practically $5,000,000.00 for the steel company.

The installation of these Open Hearth Charging Machines—the first of any kind to be installed by any steel company—marked an important step in the development of the steel industry.

The Westinghouse Company was the pioneer in the application of electricity in the steel industry. The thorough reliability which characterized our early designs has been strengthened by thirty years' experience, and today Westinghouse Steel Mill equipment can justly be said to be unexcelled in strength and simplicity of construction and economy of operation.

Westinghouse Electric & Manufacturing Co.
EAST PITTSBURGH, PA.



W
WESTINGHOUSE ELECTRIC

Westinghouse

J. H. Hillman & Sons Company

OLIVER BUILDING PITTSBURGH, PA.

Standard CONNELLSVILLE COKE

FOR

Blast Furnaces and Foundries

Shipments 3,000,000 Tons Annually

SHIPMENTS VIA: P. & L. E. R. R., N. Y. Central and Connections. P. R. R., Penna. Lines and Connections. B. & O. R. R., and Connections.

FOBEWOOD COAL and IRON CO.
Farmers' Bank Building
PITTSBURGH, PA.

Furnace and Foundry Coke

Steam, Gas and Smithing Coal

Prompt Shipments

BOSTON OFFICE:
1103 Little Building

Sales Agents for
Aetna Foundry & Machine Co.
Grey Iron Castings
Hudson Sheet & Tin Plate Co.

THE "BLAW" BULLDOG

For Rehandling Ore, Slag, etc.

For Excavating and Dredging

It bites its way in!

Comfort—

Efficiency

Blaw Buckets

Note the wide opening jaws, which descend in a slightly inclined position; the reeving (5 parts of line), which, with lever arm, gives the BULLDOG its great closing power; the very sturdy construction throughout, which is necessary on account of its enormous closing power; the stop chain, which keeps the bucket from opening too wide; the use of grease plugs in place of cups; the rigid head block, which eliminates all possibility of wobbling.

BLAW-KNOX

Knox Kooled

"KNOX" Water Cooled Floors give year-round comfort to the men—added energy and efficiency.

Temperature is controlled by the flow of water. Only one supply pipe and one outlet at each standing, and waste water can be used.

Built of wrought steel throughout, and cannot crack. Made to fit any floor space—yours for instance.

Write for a copy of the "BLAW" BULLDOG Folder.

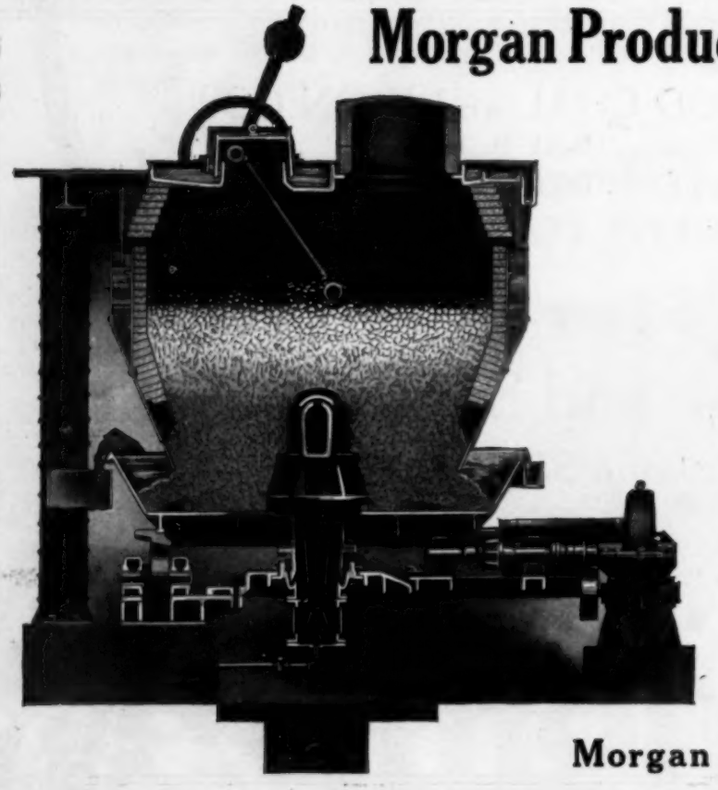
BLAW-KNOX COMPANY

602 Farmers Bank Bldg., Pittsburgh, Pa.

New York Chicago San Francisco Sheffield, Eng.

Can the "KNOX" Engineers help with your problem? They are ready!

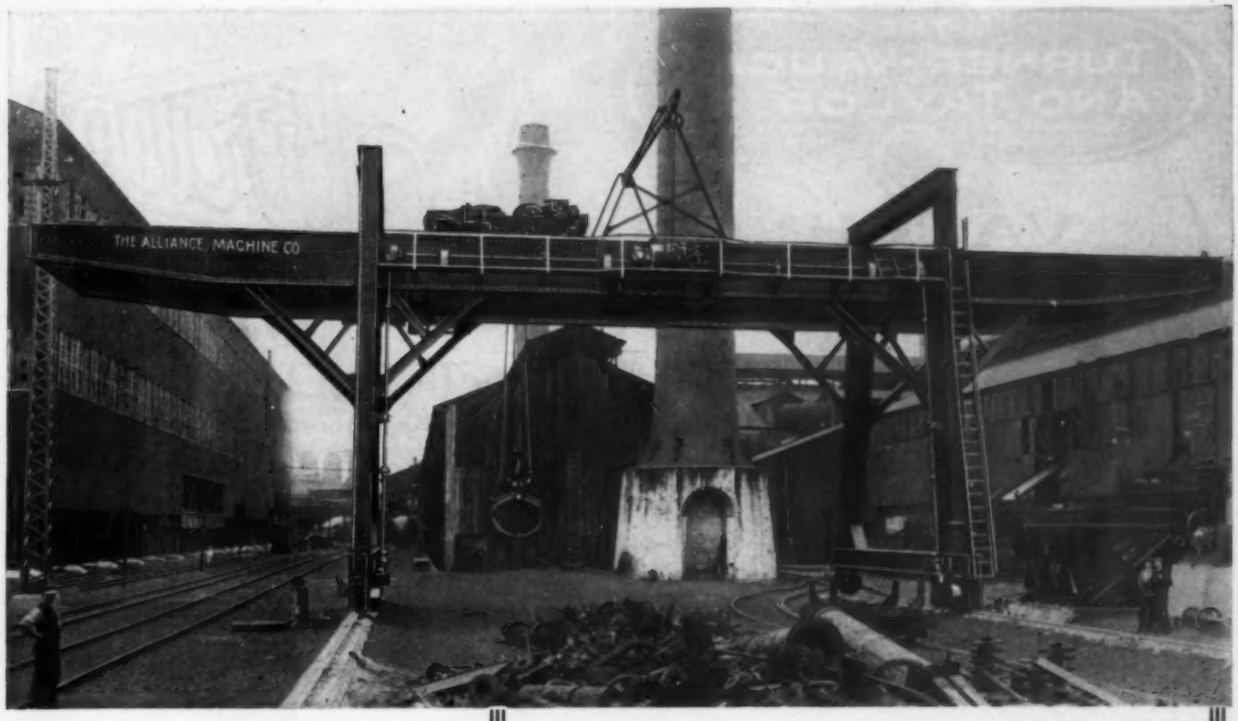
Morgan Producer-Gas Machines



have eliminated human strength, endurance and neglect as factors in the gasification of coal.

The all-round satisfaction given by these splendidly built machines, due to their continuous performance without breakdown or other interruption, is acknowledged gratefully by all users fortunate enough to possess them. Capacity 3,000 lbs. gas coal per hour.

Morgan Construction Company
Worcester, Mass.



The
ALLIANCE MACHINE COMPANY
ALLIANCE, OHIO

PITTSBURGH BIRMINGHAM

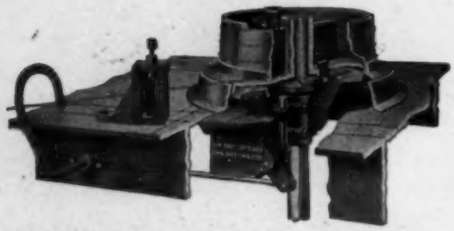
A Special Alliance Crane

The crane illustrated on this page is a *Ten-Ton Special Gantry Crane,* Four-Motor Type, 46-foot Span, with 24-foot and 25-foot Cantilever Extensions. The Cage is attached to the trolley from where the operator controls the Ingot and Bloom Handling Tongs shown. Trolley also provided with magnet Hoist.

Our successes of the past are but a prophesy of the higher achievements we have set for the future.

THE TURNER-VAUGHN AND TAYLOR CO.
ENGINEERS AND MANUFACTURERS — CUYAHOGA FALLS OHIO, U.S.A.

VAUGHN
Safety Devices *for* Wire Mills

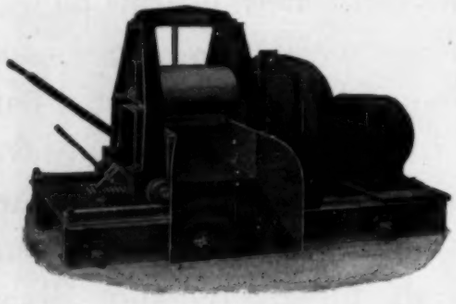


VAUGHN Patented Safety Block Lift for Frames.

In addition to protecting your workmen, this safety appliance, in the event of a tangle, will raise the block from the driving lugs without breaking the wire.

VAUGHN Safety Die Holder.

In this Die Holder, two knives are geared directly to a bar pinned to a loop through which the wire passes. When a workman or other object is caught and brought in contact with the loop, it is forced forward, closing the knives, which immediately cut the wire.



Vaughn Scrap Bundlers have a stationary spindle. The Carriage and Feed Trough are movable.

These machines for wire and wire-rod scrap are made in two sizes—guaranteed to produce firm, regular bundles, 16 x 18 and 18 x 24 inches in size.

THE TURNER-VAUGHN AND TAYLOR CO.
ENGINEERS AND MANUFACTURERS — CUYAHOGA FALLS OHIO, U.S.A.

Moltrup's

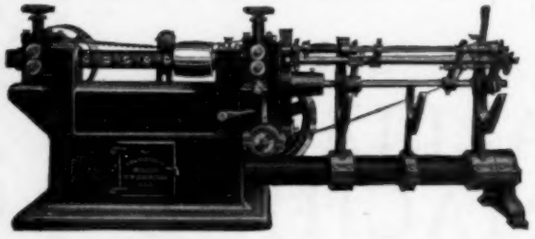
FINISHED KEYS
The Only Keys Worthy of Your Product

Standard Gib Head
Cut Under Gib Head
Plain Taper
Round End Feather
Special Keys for every class of work

We also manufacture machine rack; flattened ground steel plates and discs; engraving plates; cold drawn steel—rounds, hexagons, squares, flats and special shapes.

Moltrup Steel Products Co.
BEAVER FALLS, PA.
AGENCIES:
Chester, Pa.—Allison & Co.
Chicago and Detroit—Central Steel & Wire Co.
New York: Geo. Nash Company.
Boston—Edgar T. Ward's Sons San Francisco—Milton Pray

57,000 FEET PER DAY



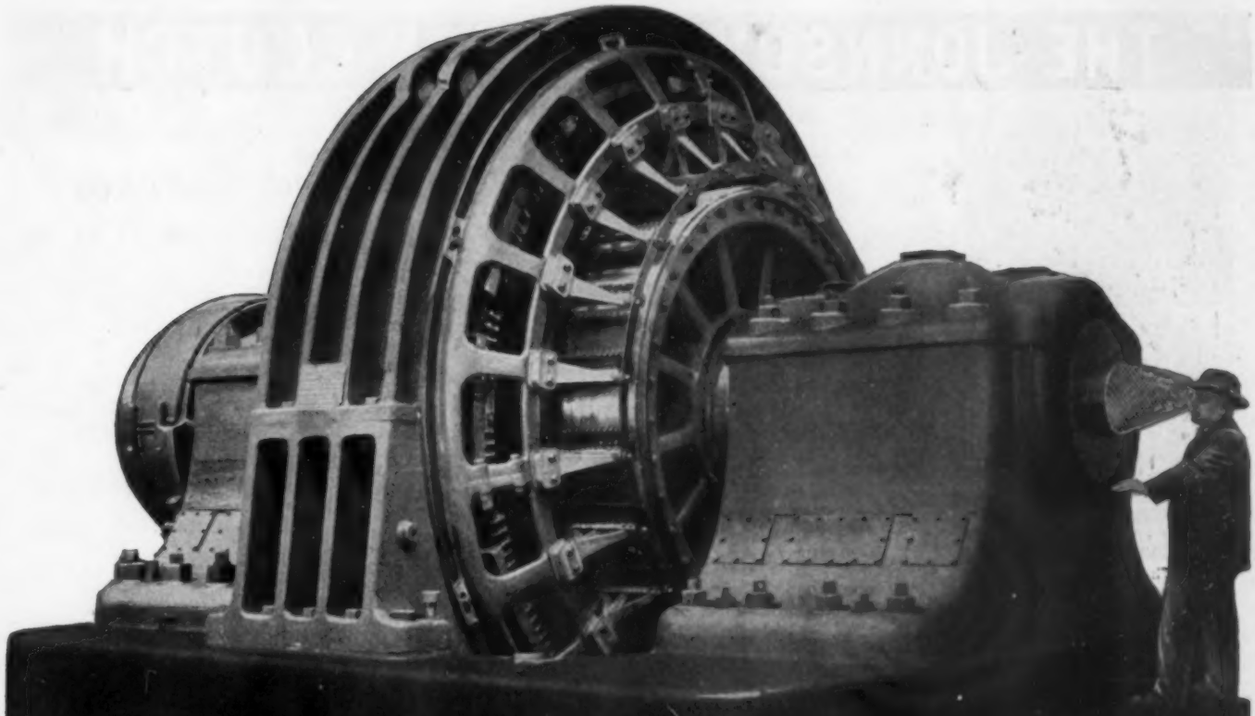
of straight wire cut to accurate lengths of 9 ft. 6 in. is the production one user gets from one of our AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINES, and at this rate it took them less than a month to pay for their machine.

Don't you want to know more about it? Send for Catalogue T.

THE F. B. SHUSTER CO.
Formerly John Adt & Son

Established 1866 **New Haven, Conn.**

Also makers of Straighteners and Cutters for SQUARES, HEXAGONS, etc.



Typical Reversing Rolling Mill Motor

Answering the World's Tonnage Call With Largest Single Unit Motors

Larger and larger G-E motors are being built to meet the ever increasing demand for more steel. A typical recent G-E reversing rolling mill motor of this type has a momentary rating of 10,000 h. p. at 40 r. p. m., of 7500 h. p. at 120 r. p. m. and a continuous rating of 2500 h. p., showing it to be easily the largest single unit motor in the world.

Carefully consider the following features of this motor which show its splendid adaptability to mills operating on maximum tonnage schedules:—

For Maximum Production

The maximum rate of acceleration which can be obtained with any mill equipment.

Low flywheel effect.

Generator fields laminated.

Large overload capacity.

Operates mill faster than is possible with other than electric power.

Speed maintained when steel enters mill.

For Thorough Reliability

A large motor shaft which is not injured by spindle breaking.

Steel construction is used throughout.

Automatic and fool proof control.

Motor and generator fields fully compensated.

Commutating poles used.

Stronger than any part of the driven mill.

Our specialists will promptly confer with you if requested

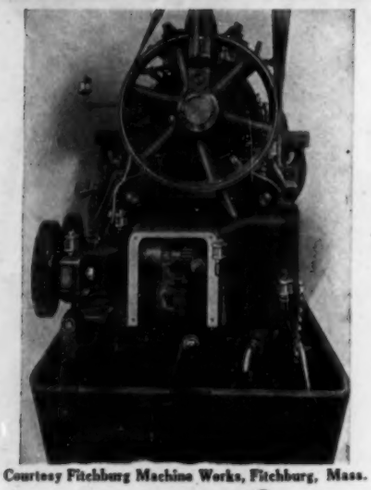
General Electric Company

General Office SCHENECTADY, N. Y.

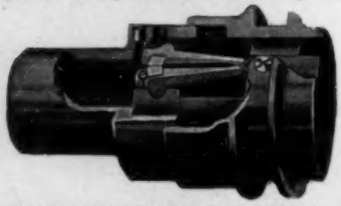
Sales Offices in All Large Cities

7372

THE JOHNSON FRICTION CLUTCH



Courtesy Fitchburg Machine Works, Fitchburg, Mass.



SECTIONAL VIEW SINGLE CLUTCH—DISENGAGED

Is used wherever unfailing service is required.

Have you ever considered Clutches?

There is a JOHNSON FRICTION CLUTCH for your needs.

Our Engineers will co-operate with you in incorporating a Clutch in your design.

The JOHNSON FRICTION CLUTCH can be made special to meet any condition.

Ask any user what he thinks of JOHNSON FRICTION CLUTCHES. They all answer the same. *"They're the Best to be Had."*

Send us data on your requirements.

Write for your White Catalog and Booklet "Clutches as Applied in Machine Building"

CANADA—Williams & Wilson, Ltd., 320 St. James St., Montreal. The Canadian Fairbanks-Morse Co., Ltd. Toronto and Branches.
ENGLAND—The Efandem Co., Ltd., 159 Gt. Portland St., London, W., Sole Agents for British Isles.
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THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

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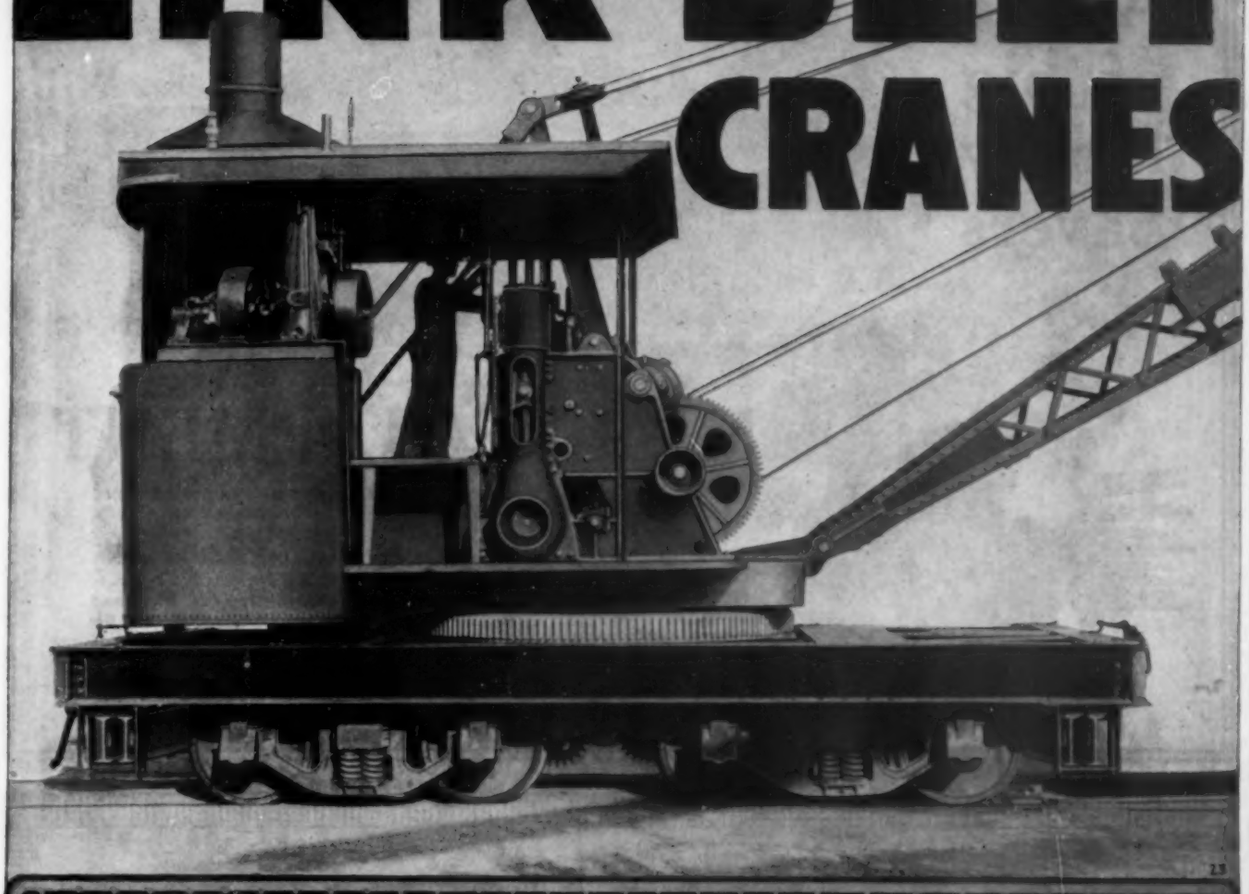
LINK-BELT CRANES



RENOWNED *for* SERVICE

THERE is no other single device so essential to low cost and speedy construction in a shipyard as a locomotive crane. It is extremely useful in the general handling of material around the yard, and is indispensable for handling material during the construction of vessels on the ways.

An economical arrangement for a modern yard is to mount a long-boom locomotive crane on a trestle between each pair of ways. Nineteen Link-Belt Locomotive Cranes are so used by a single shipyard on the Pacific Coast. Write for catalog.

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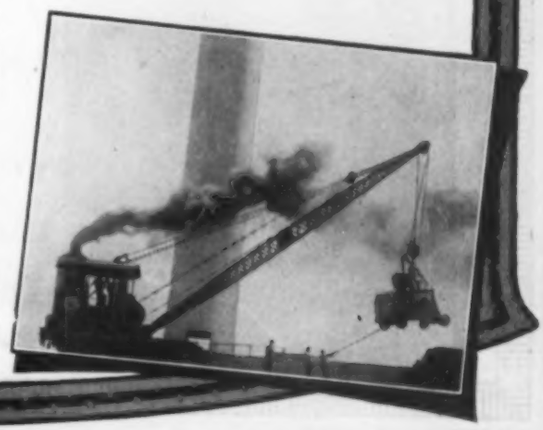

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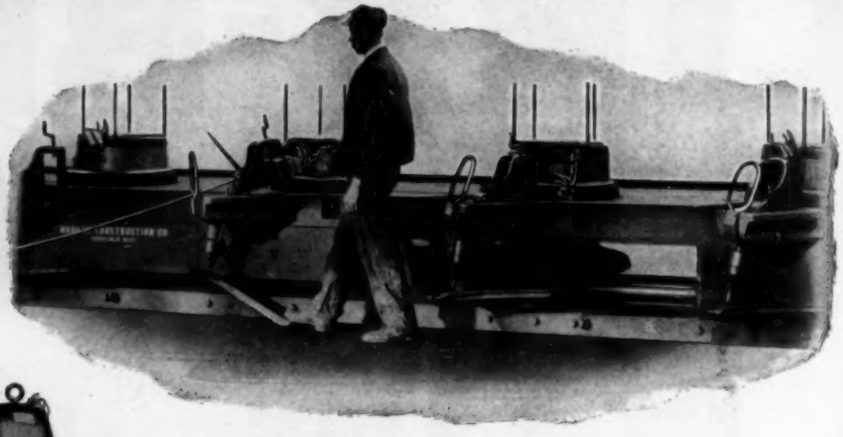

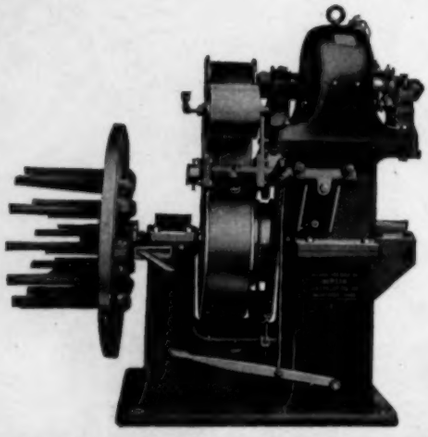

Rod Frame equipped with Carroil Friction Block

MILL EQUIPMENT

The above illustration shows one of our heavy rod frames equipped with ***Friction Blocks.*** Enclosed within each block is a coil clutch. We equip each block with an automatic safety stop.

No draw-out mechanism is required, and the machine is characterized by high efficiency and low maintenance costs.

We also design and build MILLS for ***Billets, Bars, Thin Flats*** and ***Rods.*** Also Heating Furnaces, Cooling Beds, Dyblie Gas and Air Reversing Valves. ***Write us for full details.***

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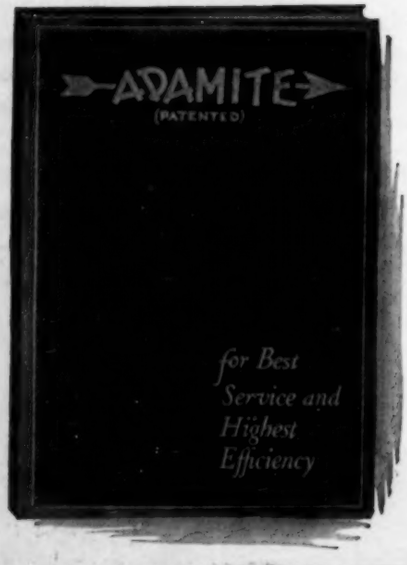

Make Profits Right With "ADAMITE"

Now-a-days the percentage of profit is more than ever before dependent on efficient machine production and skilled labor. The results with both elements will be enhanced if you use "Adamite" rolls, gears, pinions, dies, etc., in your plant. Maximum machine efficiency will be assured because of the continuous uninterrupted service which "Adamite" will give. Your skilled workmen will not be called on to make costly repairs and be idle during breakdowns and delays, but will be able to render their full measure of service in other directions.

The "Adamite" book describes the product and its hundreds of uses. We are sure it will be of interest to you. Write for a copy *today*.

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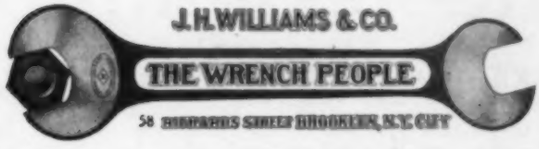
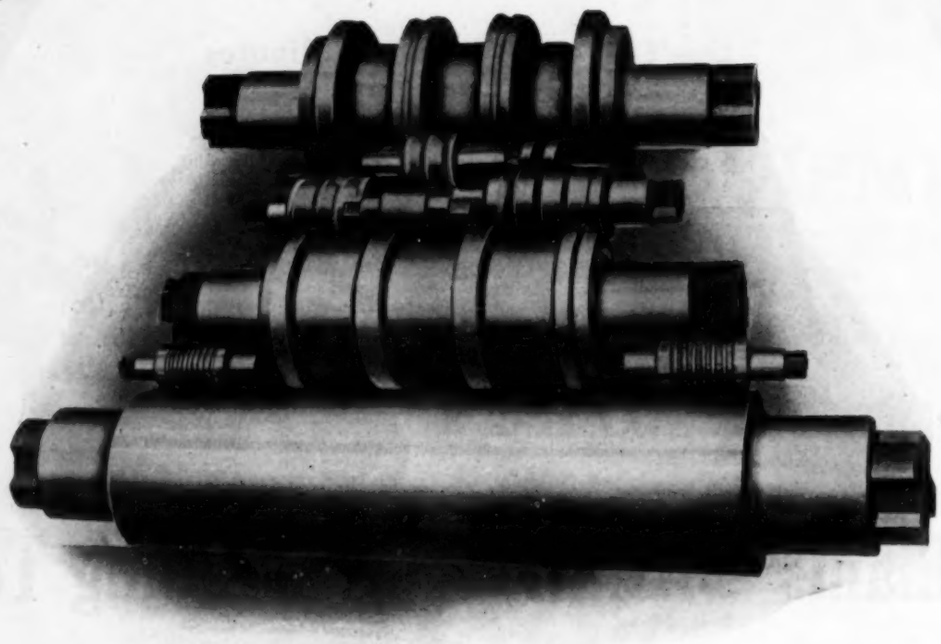
They can be supplied promptly from your dealer's stock or from ours.



Rolling Mill Equipment



Manganite and Superior Steel Rolls

Manganite Rolls are productive of greatest tonnage with lowest costs. Used in blooming mills, billet, structural and continuous mills and for sheet roughing rolls.

Our rolling mill line includes blooming, universal, (for slabs and plates), structural and rail, plate, sheet and merchant mills.

Mackintosh, Hemphill & Co.
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DO you know that your old, worn or troublesome valves can be replaced by **MESTA Automatic Plate Valves** that are unencumbered by gear, that require no repairs or lubrication and that will give an increase of 10-35% in air delivery?

MESTA AUTOMATIC PLATE VALVES (Iversen Patent) have the backing of repeated successes in replacing existing valve equipment on blowing and compressing units in such a way as to raise the volumetric and mechanical efficiency to standards hitherto thought impossible.

Further information may be had
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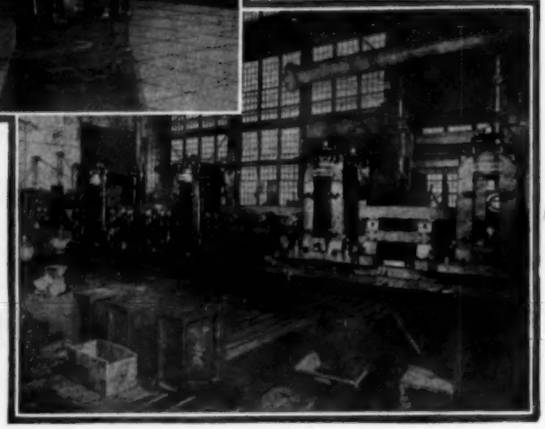
MILL BUILDERS

Blooming Mill

Built for the Youngstown Sheet & Tube Company and the Brier Hill Steel Company.

Purely Hydraulic Forging Press

One of 175 existing installations for piercing and drawing shells and projectiles.



Continuous Rod Mill

Built for the American Steel & Wire Company Birmingham, Ala.

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Builders of Complete Machinery Equipment for Iron, Steel and Tube Works; Steel Castings; Machine Molded Gears; Forging Presses; Steel, Sand, Chilled and "Adamite" Rolls.

"Largest Roll Makers in the World, Makers of the Largest Rolls"

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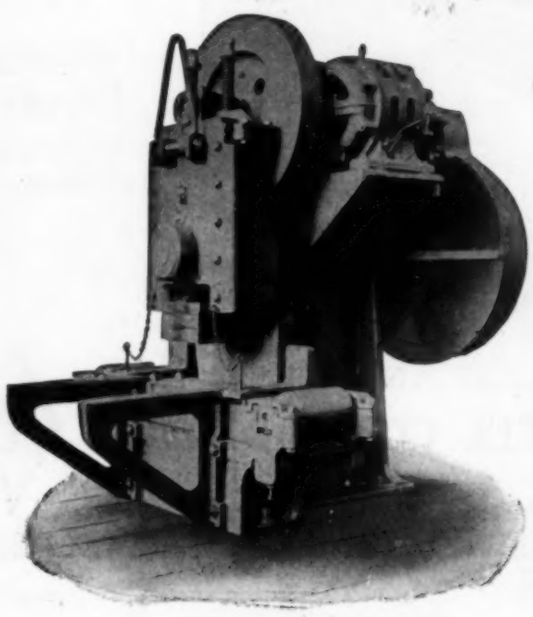
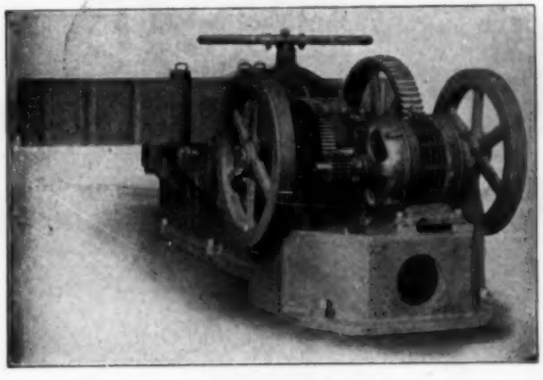


SEMI-PORTABLE TYPE



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which means **"Steady Diet"** at a full rated capacity for a day, a month or a year. :: ::

Semi-Portable Type

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Smaller press of same design for light section.

Horizontal Type

for straightening Rails, Beams or Round Sections

Screw Adjustment for maximum or minimum gap, eliminating loose blocks. :: :: ::

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Builders of Complete Machinery Equipment for Iron, Steel and Tube Works; Steel Castings; Machine Molded Gears; Forging Presses; Steel Sand, Chilled and "Adamite" Rolls.

"Largest Roll Makers in the World, Makers of the Largest Rolls"

Finest Quality

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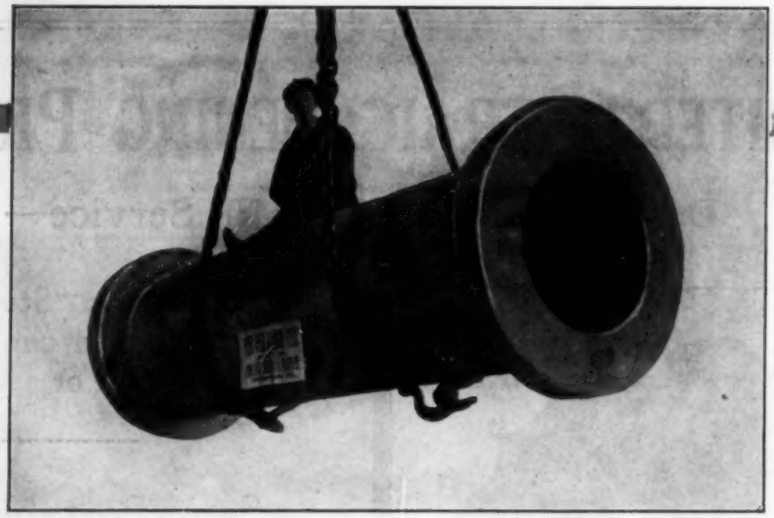

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Acid Open Hearth Process

Forging Ingots
Any Size
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STEEL CASTINGS

up to 100,000 pounds

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The war has taught the foreign manufacturer the American method of discarding any machine or structure that is inadequate to his needs. As a result the advantages of our day-light plants, standardized production and labor saving equipment have been so evident that we can count on a continued "after the war" demand for these things.

However, a permanent export trade requires a definite sales policy, actively supported by an organization that knows local foreign markets and has facilities for conducting every detail of international merchandising.

The Federal Export Corporation is such an organization with a staff of very capable men. E. F. Bliss, formerly equipment engineer with Westinghouse, Church, Kerr, is the Fedex man advising with foreign manufacturers on the mechanical layout of their factories and yards.

FEDERAL EXPORT CORPORATION
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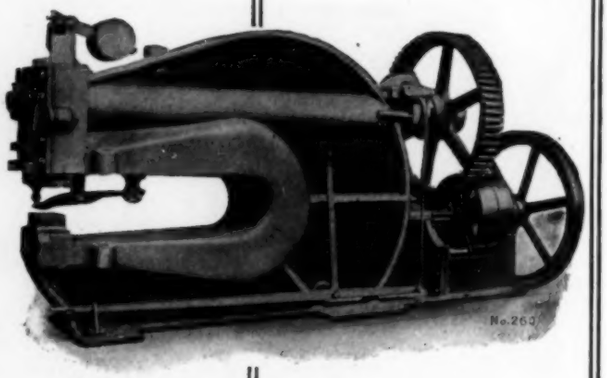

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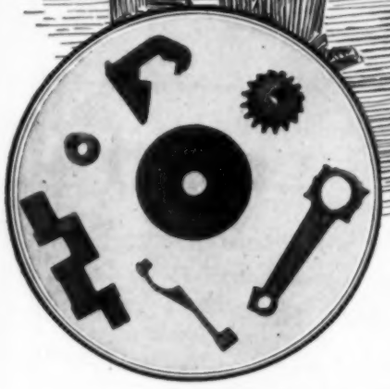
"CLEVELAND" Punches are known everywhere for their efficiency, accurateness and durability. Made of the best materials, by experienced, high grade workmen, we guarantee them to fulfill every requirement for such equipment. Send for catalog illustrating and describing in detail the "Cleveland" line of punches.



Powerful in the Strength of Sivyer Steel Castings

Guaranteeing your machinery to be powerful—economical in maintenance—dependable to the maximum degree—today means it is equipped with Sivyer Steel Castings or their equal. Shrewd buyers demand nothing less.

And it's difficult to find a casting so inherently strong, dense of texture, free from imperfections as Sivyer Steel Castings. The difference in cost is not worth the effort when you consider the marked difference in the quality standards which produce Sivyer's and those "nearly as good."

It's worth a fraction of a cent more to know your engine, machine, tool, equipment, can be relied upon to emphasize your reputation as a builder of a better product.

Ask us how and why.

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How To Make Converter Steel Castings

By Arthur Simonson

THE author of "How to Make Converter Steel Castings" has taken for his subject just this one phase of the foundry trade. He concentrates on it. He has put all his efforts into making clear just what you should and should not do, as well as how to do it. It is fully illustrated with photographs and plans so that there is no chance of going wrong in following the directions. When you have read "How to Make Converter Steel Castings" you will ***really know*** every detail of the process and ***just how*** to ***get results.***

Table of Contents

Construction of the Converter
Lining the Converter
Analysis of Iron to be Converted into Steel
Operation of the Converter
Hot Cracks in Steel and How They May be Overcome
The Steel Foundry Laboratory

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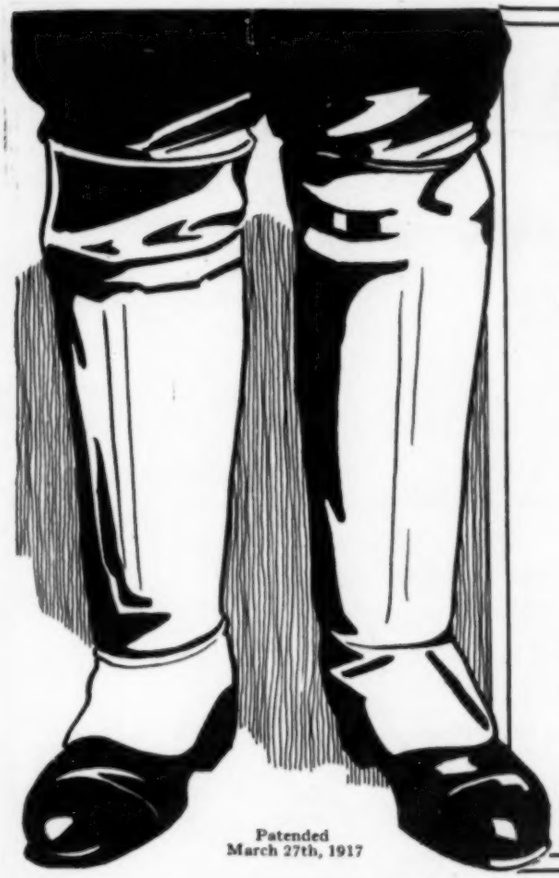

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March 27th, 1917

Spattering Metal

UNIVERSAL SAFETY

offers no hazards to the men who wear

Universal "Safety First" Molders Spring Knee Leggins

They are fire-proof, comfortable and convenient. Can be put on or taken off instantly. Made of leather, asbestos, or fire-proof duck. Especially adapted to workers in iron, steel and brass foundries.

We also manufacture Fire-proof Gloves; Mittens; Aprons; Hip Leggins; Spats; Suits; Coats; Pants; etc.

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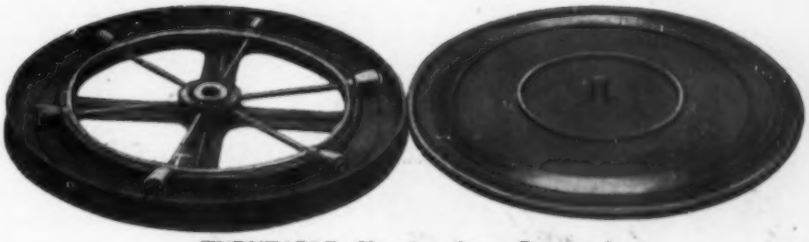
Turntables

RIGID, self-contained construction. No tipping, no getting out of line, no journal friction

Load is carried on conical chilled rollers, running on machined path, giving long life and smooth, easy operation.

Tops furnished plain or with raised or grooved tracks. Smaller sizes with plain tops kept in stock; also frogs.



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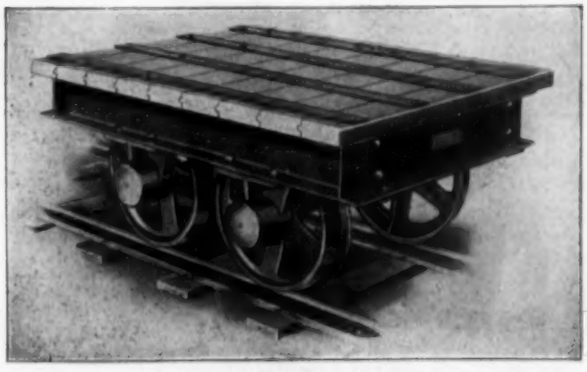

668—Standard Steel Truck

Trucks and Cars

Built for severe service in the foundry, shop or yard.

Heavy steel frames and castings of ample section give long life. Our design of roller bearings results in a very light-running truck.

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Complete Foundry Equipments

WHITING
FOUNDRY EQUIPMENT CO
HARVEY-ILL. U.S.A.
CHICAGO SUBURB

Cranes of all Types

WHAT MAKES A GOOD ABRASIVE DISC

Enlarged Section of Gardner Abrasive Disc

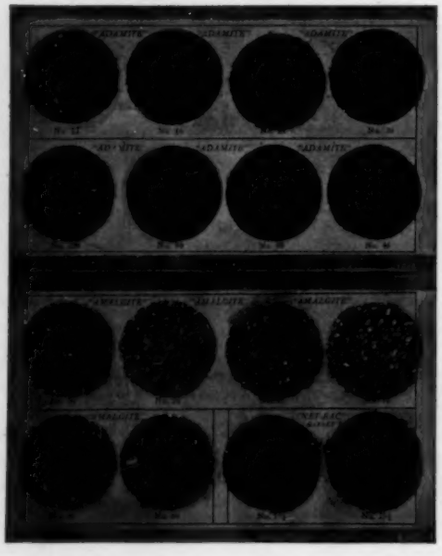
IF you operate any kind of a disc grinding machine in your plant it will be to your advantage to acquire all the information given on this page.

It never pays to use an abrasive disc simply because it is cheap. You should learn how a disc is made, study its make-up and measure the results it gives. The purchasing and use of abrasive discs present a greater opportunity for effecting savings or incurring wastes than any other line of supplies used by the trade. Here are the main essentials of a Gardner Abrasive Disc:

(1) GRAINS, ABRASIVE. (a) They are carefully selected according to the metal to be ground; (b) they are accurately screened to size; (c) they are free from dust and other impurities frequently present with this material; (d) they are sharp and possess the necessary fracture qualities; (e) Gardner discs carry the maximum amount of grains practicable.

(2) BOND, GLUE. (a) We use a glue specially prepared for abrasive disc service; (b) it is brittle yet elastic enough to release dulled grains, thereby exposing new cutting points; (c) a large amount of glue is used but not enough to interfere with the cool, free cutting action of the disc; (d) Gardner discs can be kept in proper storage an unusually long period of time without bond deterioration.

(3) BACKING, CLOTH. (a) The cloth used in Gardner discs is an especially heavy and tough drill; (b) it is uniform in thickness and free from wrinkles or uneven spots; (c) the edges are trimmed smoothly and closely to size for diameter and center hole; (d) the grain number, kind of material and lot number is printed on the cloth back of every disc. By this means the consumer knows exactly what he is using and we are enabled to keep a close record of every disc we send out.



Samples of This Material—Free

As consumer of abrasive discs you should have in your files a free copy of our "No. 16 Abrasive Disc Folder." It contains 14 actual samples of the famous "Adamite" and "Amalgite" material; also, two samples of "Net-bac" Garnet Paper used on Pattern-makers' disc grinders. In addition to showing samples of abrasive material, this book tells how to properly reface steel disc wheels, what to do when grinding aluminum and soft metals and gives other information of benefit to all users of disc grinding machines.

Gardner abrasive discs are manufactured for us by Herman Behr & Co., Inc., New York City, who have been making abrasive cloth and paper goods for the past 60 years. Combined with this fact is our intimate knowledge of modern disc grinding requirements. We know what is needed—they know how to make it. Gardner Abrasive Discs not only give maximum service but entitle you to unlimited co-operation from "The Disc Grinding Authorities."

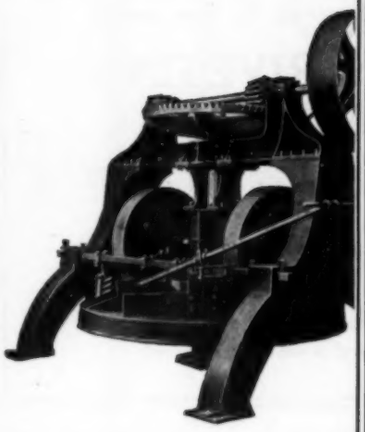
Gardner Machine Co.

BELOIT, WISCONSIN, U. S. A.

BUILT RIGHT
RUN RIGHT

How are you meeting the advance in material cost?

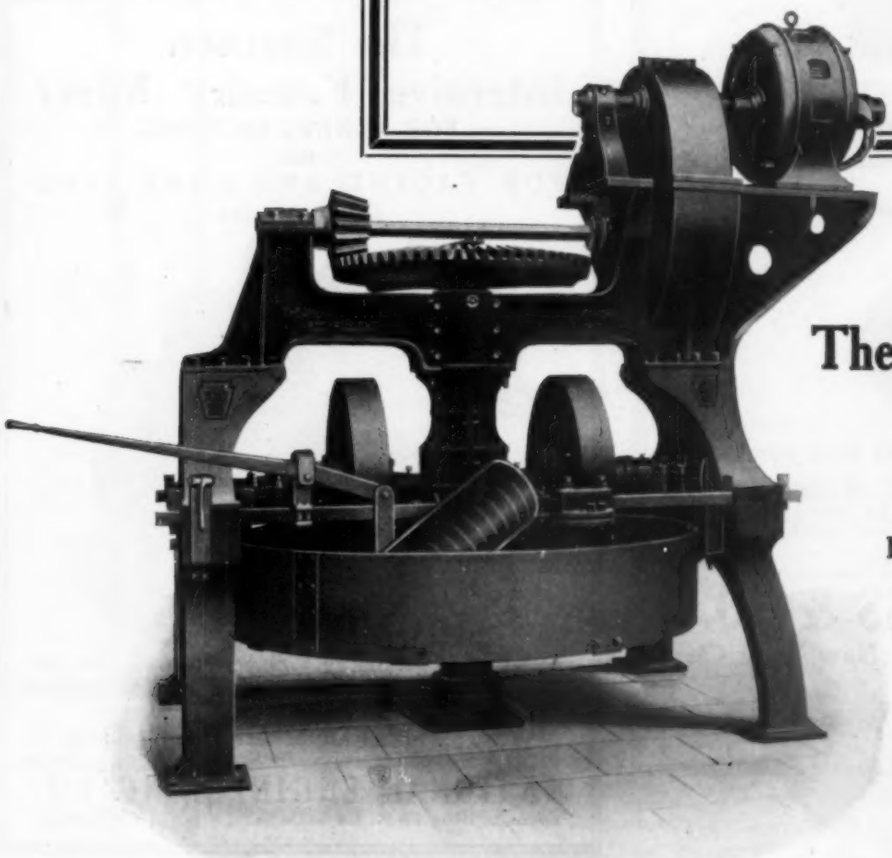
Why not make the material you are using deliver its maximum, and thus reduce your cost of production?



American Grinding Pans

By operating an American Grinding Pan you can reclaim all the metal that is lost in flue dust, and all the core sand from discarded cores. Besides, you can save at least $5.00 a barrel on your core oil by using this reclaimed sand. The "American" is also very efficient for grinding ganister.

Let us show you how an "American" will pay for itself in less than a year.



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BUCYRUS, OHIO

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MOSS

Tool and Pay Roll Checks establish system and promote efficiency

A guarantee against lost or stolen tools, inaccurate time-keeping, and pay day errors.

Made in either brass or aluminum—in any shape or size—any quantity.

Write for prices.

If it's metal or rubber and you can read it or the work it does, ***we make it.***

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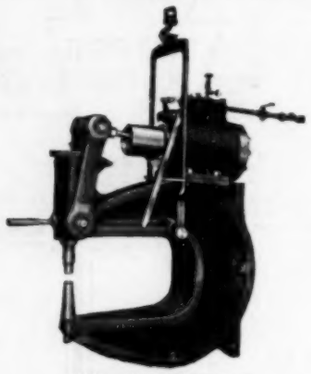

Allen Jaw Riveter

Direct Leverage gives the large Riveting Capacity obtained by the use of

ALLEN RIVETING MACHINES

This is probably the most popular of ALLEN machines. The shape of the frame allows it to be employed in many difficult places, and it is extensively used for all-around structural work. The pressure is exerted in a direct line with the axis of the rivet and the movement is exceedingly smooth. Can be operated horizontal, vertical or inverted.

"Whatever the Riveting, There's an Allen for the Job."

Send for Catalog and full details

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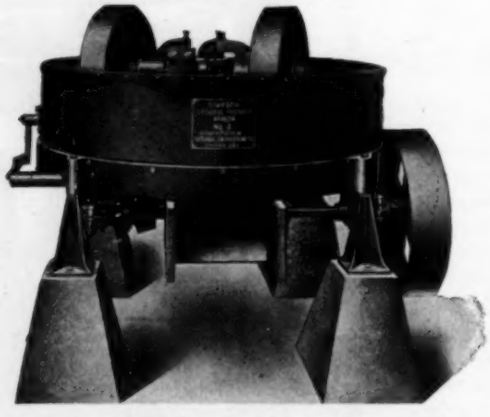
372 Gerard Avenue, New York

The Simpson Intensive Foundry Mixer

FOR MIXING DAUBING

also

FOR FACING AND CORE SAND in Foundries



Automatic Discharge. Saves Labor. Proper mechanical action for mixing. Efficient mixture.

Write for list of users, details and price to

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INDUSTRIAL
EQUIPMENT

Can Save Dollars in Your Plant

THE saving in production costs and the simplification of handling systems are the principal reasons why many factories are using Lakewood trucks.

No. 302 and No. 742 are so universally useful that nearly every factory can use them profitably.

And further, there is no branch of industrial transportation which our Engineers have not studied and which there is not equipment in the Lakewood Line to fill that specific need.

If you do not find exactly what you want among our hundreds of trucks, car skips and other appliances, ask them to study your problems.

Perhaps our Car Book No. 16 would be useful.

The 302 Truck illustrated above, a favorite for general floor, also truck No. 1742 carried in stock for immediate shipment.

Link up with Lakewood

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Lakewood Engineering Co. Cleveland

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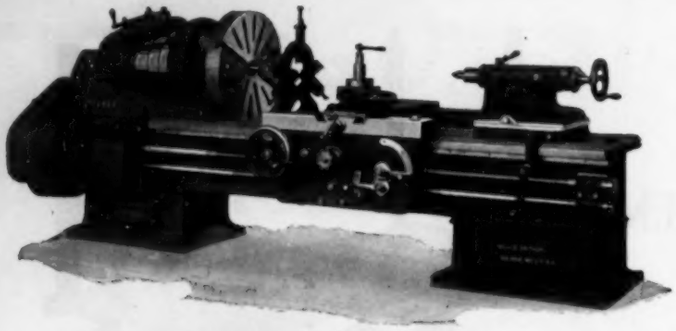

26" Wickes Heavy Duty Engine Lathe

Wickes

Heavy Duty Engine Lathe, built any lengths, has 3 step cone, is double back geared and has double plate apron. Built belt or motor driven.

Let us tell you about this and also our 36", 32", 20" and 17" Lathes.

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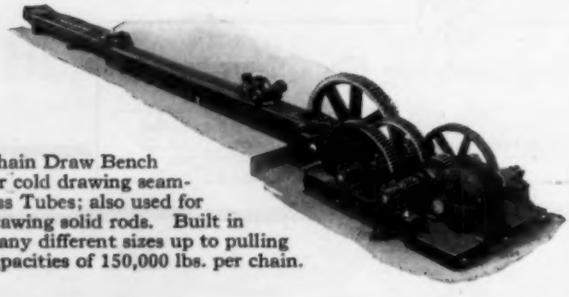

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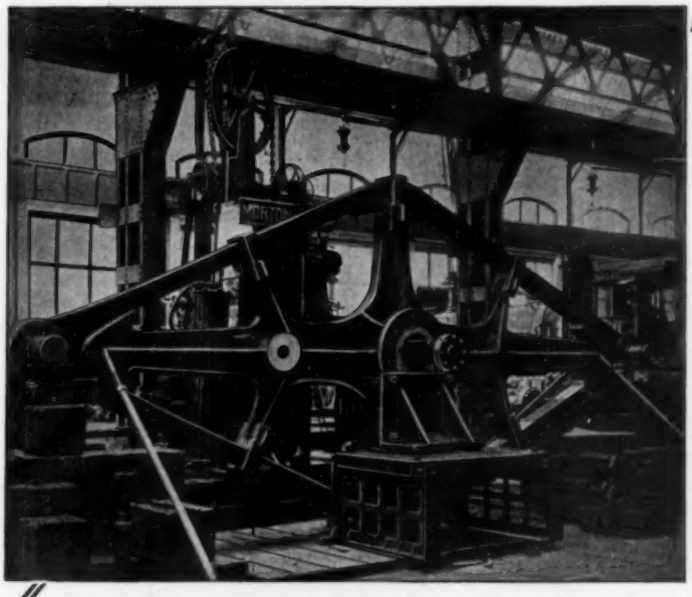

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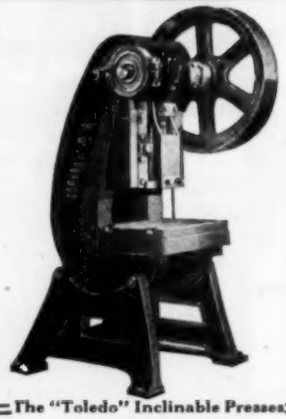

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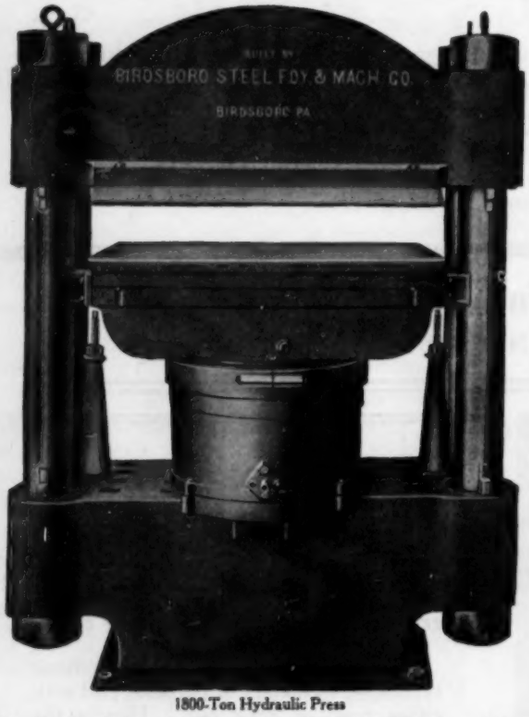

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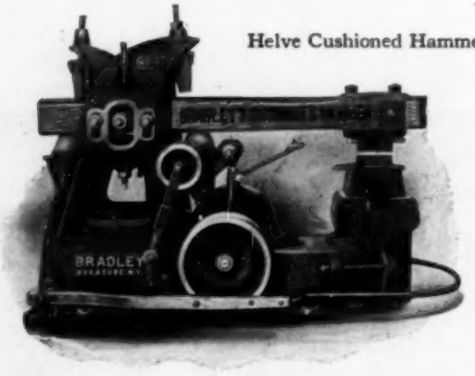

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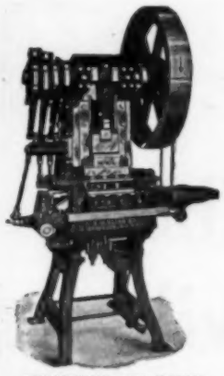

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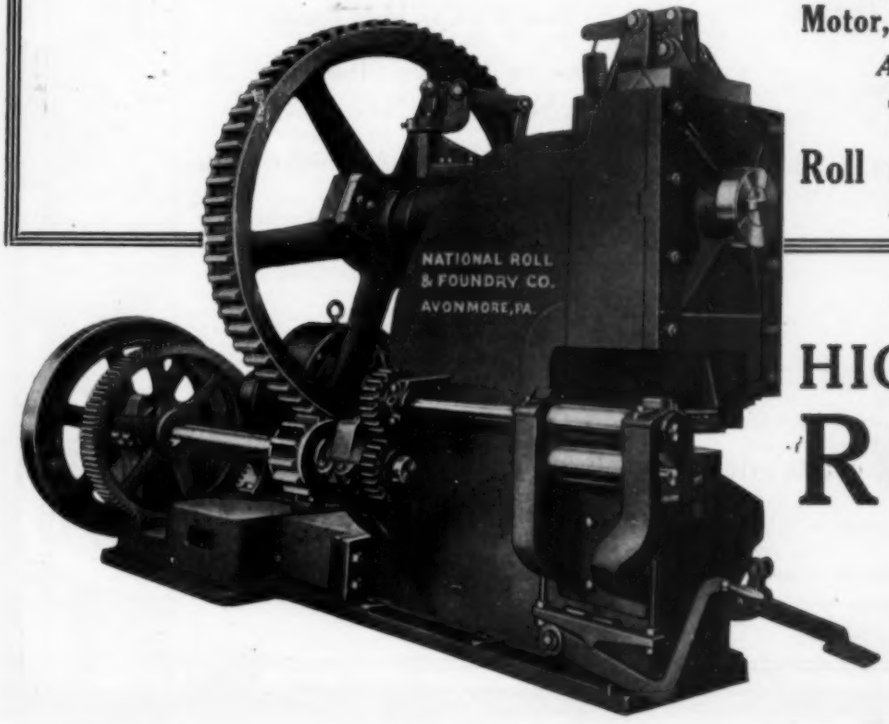

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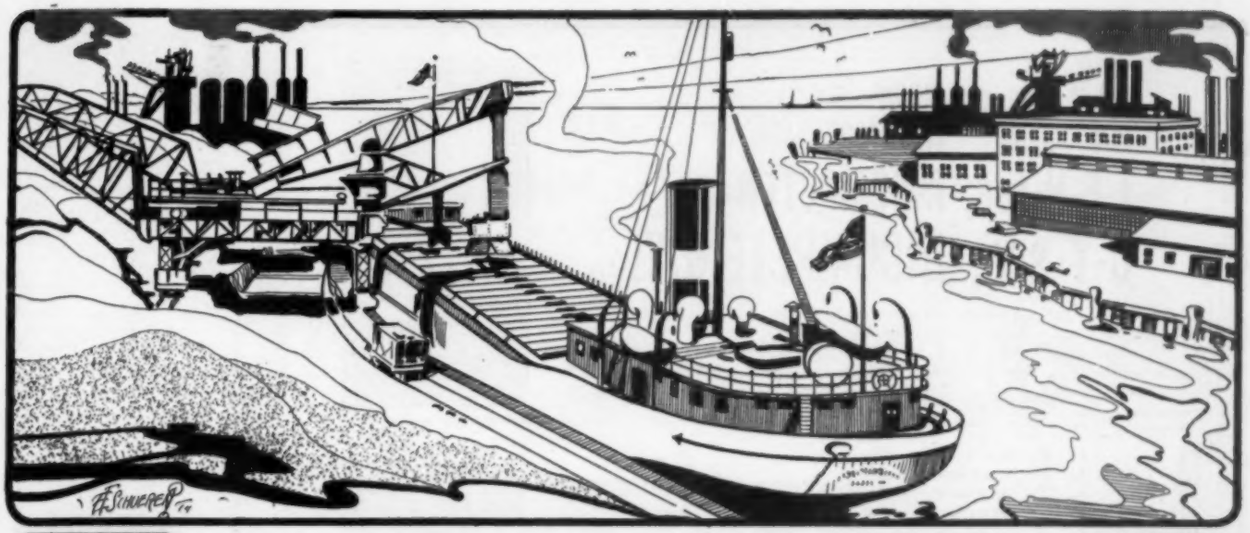

CLEVELAND, OHIO, DECEMBER 27, 1917

THE IRON TRADE REVIEW

A weekly publication devoted to the Iron, Steel, Machinery and Foundry Industries of the United States and Canada.

Published Every Thursday by THE PENTON PUBLISHING CO., Cleveland.

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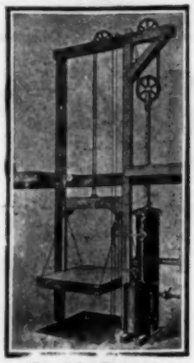

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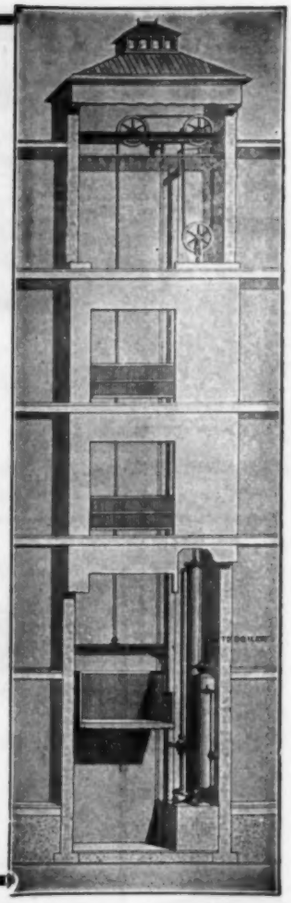

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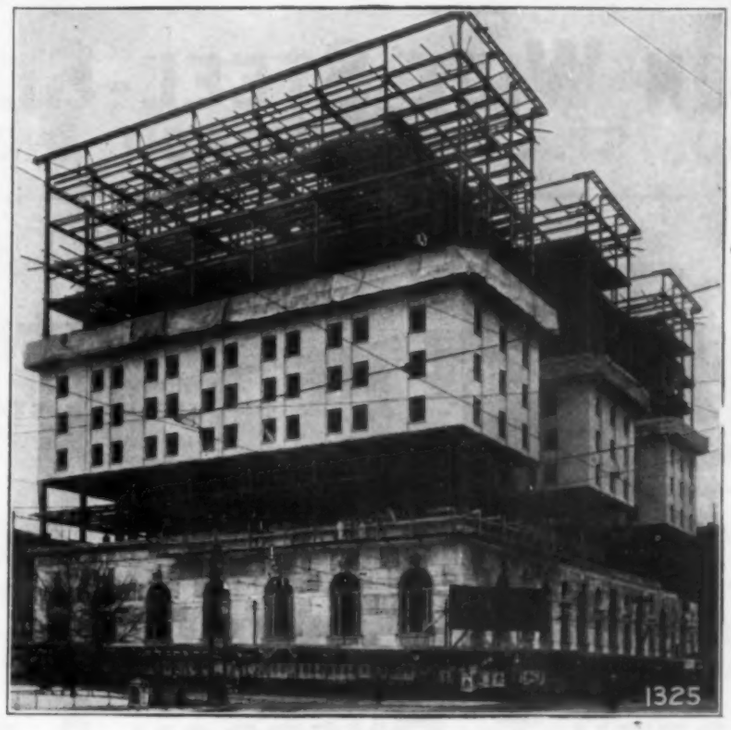

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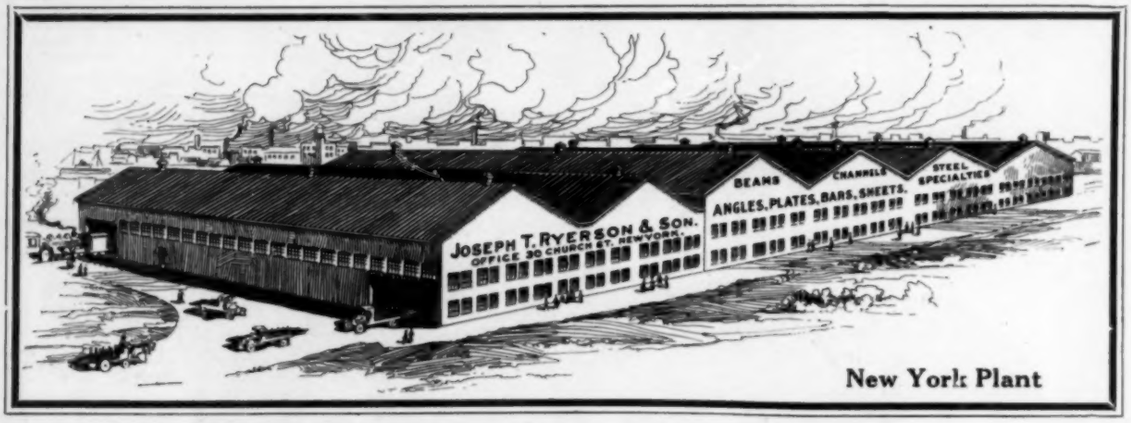

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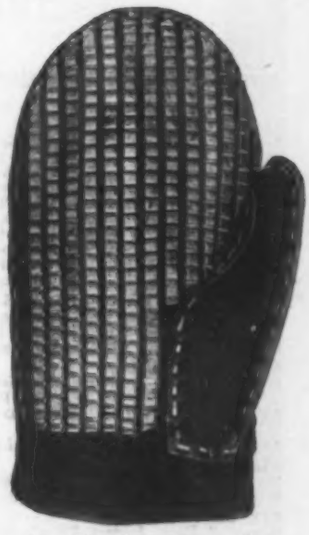

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American Bridge Co., New York City.

BARS (Concrete Reinforcing).
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Franklin Steel Works, Franklin, Pa.
Inland Steel Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.
Laclede Steel Co., St. Louis, Mo.
Pacific Coast Steel Co., San Francisco, Cal.
Ryerson, Jos. T., & Son, Chicago, Ill.
Trussed Concrete Steel Co., Detroit, Mich.
Upson Nut Co., Cleveland, O.

BARS (High Speed Steel).
Century Steel Co. of America, New York.
Onondaga Steel Co., Syracuse, N. Y.

BARS (Iron and Steel).
American Bridge Co., New York, N. Y.
American Steel Export Co., New York City.
Amiron Supply Co., Inc., New York, N. Y.
Belmont Iron Works, Philadelphia, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Brown-Wales Co., Boston, Mass.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Federal Export Corporation, New York City.
Ford, R. M., & Co., Inc., New York, N. Y.
Franklin Steel Works, Franklin, Pa.
Harvey, Arthur C., Co., Boston, Mass.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.
Latshaw Steel & Metal Products Corp., New York, N. Y.
Liberty Steel Products Co., New York.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
Milton Mfg. Co., Milton, Pa.
Pacific Coast Steel Co., San Francisco, Cal.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Standard Gauge Steel Co., Beaver Falls, Pa.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
United Alloys Steel Corp., The, Canton, O.
Upson Nut Co., Cleveland, O.
Vulcan Steel Products Co., New York, N. Y.
Westerman & Co., Lockport, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

BARS (Rib).
Trussed Concrete Steel Co., Detroit, Mich.

BARS (Tin).
Andrews Steel Co., Newport, Ky.

BEAMS, CHANNELS AND ANGLES.
American Steel Export Co., New York City.
Belmont Iron Works, Philadelphia, Pa.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Chesapeake Iron Works, Baltimore, Md.
Empire Art Metal Co., College Pt., N. Y.
Federal Export Corporation, New York City.
Ford, R. M., & Co., New York, N. Y.
Franklin Steel Works, Franklin, Pa.
Illinois Steel Co., Chicago, Ill.
Liberty Steel Products Co., New York.
Pacific Coast Steel Co., San Francisco, Cal.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Snead Architectural Iron Works, Louisville, Ky.
Vulcan Steel Products Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

BEARINGS (Ball).
Auburn Ball Bearing Co., Rochester, N. Y.
New Departure Mfg. Co., Bristol, Conn.

BEARINGS (Ball Thrust).
Auburn Ball Bearing Co., Rochester, N. Y.

BEARINGS (Bronze, Babbitt).
Aluminum Castings Co., Cleveland.

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"BELL" HAMMERS

In Hundreds of Plants

"BELL" Hammers are doing the work that formerly required several men—and doing it more efficiently, in far less time. Sensitive enough to drive a tack, powerful enough to make a weld at a single heat, there is a **"BELL"** Hammer for every kind of forge work from the smallest up to heavy steel blooms, ingots or billets.

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Owned and Operated by Nicholson File Co.

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OF ALL DESCRIPTIONS
FROM ALL METALS UP TO 13/16" THICK

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Heavy and light, cold pressed work of all kinds in any material.
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Guaranteed to give instant and accurate results.
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TURNED SHAFTING POLISHED
SEAMLESS WELDED AND SEAMLESS STEEL TUBING
BARS, RODS, WIRE IRON—STEEL SHEETS, PLATES, SHAPES

LATSHAW STEEL & METAL PRODUCTS CORP.

WAREHOUSES
Bush Terminal Section
BROOKLYN
N. Y.

EASTERN SALES OFFICES
220 Broadway
NEW YORK
U. S. A.

BEARINGS (Vanadium Steel).
American Vanadium Co., The, Pittsburgh. Pa.

BELT CEMENT AND DRESSING.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Graton & Knight Mfg. Co., Worcester, Mass.
Texas Company, The, New York City.

BELT LACING (Leather).
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.

BELTING (Chain).
Link-Belt Company, Chicago, Ill.

BELTING (Leather).
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.

BENCHES (Steel).
New Britain Mach. Co., New Britain, Conn.

BENCHES AND FRAMES (Drawing).
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., The, Cuyahoga Falls, O.

BENDING AND STRAIGHTENING MACHINES.
Abramsen Engrg. Co., Pittsburgh, Pa.
Birdsboro St'l Fdy. & Mch. Co., Birdsboro, Pa.
Cleveland Punch & Shear Works Co., Cleveland, O.
Espen-Lucas Machine Works, Philadelphia, Pa.
Hinman, D. A., & Co., Sandwich, Ill.
Lourie Mfg. Co., Springfield, Ill.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York, N. Y.
Simmons Machine Co., Inc., Albany, N. Y.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

BENZOL RECOVERY PLANTS.
Koppers, H., Co., Pittsburgh, Pa.

BILLETS.
American Steel Export Co., New York City.
Andrews Steel Co., Newport, Ky.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Central Steel Co., The, Massillon, O.
Century Steel Co. of America, New York.
Federal Export Corporation, New York City.
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Liberty Steel Products Co., New York.
Mitchell-Tappen Co., New York, N. Y.
Mudge, Edmund W., & Co., Pittsburgh, Pa.
Otis Steel Co., Cleveland, O.
Republic Iron & Steel Co., Youngstown, O.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Upson Nut Co., Cleveland, O.
Vulcan Steel Products Co., New York, N. Y.
Whitaker-Glessner Co., Wheeling, W. Va.
Wickwire Steel Co., Buffalo, N. Y.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sheet & Tube Co., Youngstown.

BILLET DIES.
Moss, Henry, & Co., New York, N. Y.

BINS (Steel).
Edwards Mfg. Co., The, Cincinnati, O.
Empire Art Metal Co., College Pt., N. Y.

BLAST FURNACE EQUIPMENT.
Mackintosh-Memphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Treadwell Engineering Co., Easton, Pa.

BLAST FURNACE SKIP CARS.
Lakewood Engrg. Co., Cleveland, O.

BLAST FURNACE TUYERES.
Keystone Bronze Co., Pittsburgh, Pa.

BLAST FURNACE VOLUME METERS.
Clark, Chas. J., Chicago, Ill.

BLAST GATES.
Rockwell, W. S., Co., New York, N. Y.

BLOCKS (Creosoted Wood).
Ayer & Lord Tie Co., Chicago, Ill.

BLOCKS (Wood Flooring).
Ayer & Lord Tie Co., Chicago.

BLOOMS.
American Steel Export Co., New York City.
Andrews Steel Company, Newport, Ky.
Bethlehem Steel Co., So. Bethlehem, Pa.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Federal Export Corporation, New York City.
Illinois Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Liberty Steel Products Co., New York.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Upson Nut Co., Cleveland, O.
Vulcan Steel Products Co., New York, N. Y.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sh't & Tube Co., Youngstown, O.

BLOWERS.
Connersville Blower Co., The, Connersville, Ind.
General Electric Co., Schenectady, N. Y.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Roots, P. H., & F. M., Co., Connersville, Ind.
Southwark Foundry & Mach. Co., Philadelphia.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

BLUE PRINTING MACHINES (Electric).
Wickes Brothers, Saginaw, Mich.

BOILER INSULATION.
Armstrong Cork & Insulation Co., Pittsburgh.

BOILER SETTINGS.
Brighton Fire Brick Co., New Brighton, Pa.
Eureka Fire Brick Works, Mt. Braddock, Pa.
Wagner Fire Brick Co., Scranton, Pa.

BOILER TUBES.
Detroit Seamless Steel Tubes Co., Detroit.

BOILERS AND SUPERHEATERS.
Babcock & Wilcox Co., The, New York City.
Machinery Utilities Co., New York, N. Y.
Phoenix Iron Works Co., Meadville, Pa.
Uniflow Boiler Co., Philadelphia, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Wickes Brothers, Saginaw, Mich.

BOLT CUTTERS.
New York Machinery Exchange, Inc., New York, N. Y.

BOLT AND NUT MACHINERY.
Baker Bros., Toledo, O.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, O.
Newton Mach. Tool Works, Inc., Philadelphia.

BOLTS (Heat Treated).
Bethlehem Steel Co., So. Bethlehem, Pa.

BOLTS AND NUTS.
American Bridge Co., New York City.
Beals, McCarthy & Rogers, Buffalo, N. Y.
Bourne-Fuller Co., Cleveland, O.
Clark Bros. Bolt Co., Millidale, Conn.
Milton Mfg. Co., Milton, Pa.
National Bolt & Nut Co., Pittsburgh, Pa.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Rockford Bolt Co., Rockford, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
St. Louis Screw Co., St. Louis, Mo.
Upson Nut Co., Cleveland, O.

BORING MILLS.
Milwaukee Electric Crane & Mfg. Co., Milwaukee, Wis.
New York Machinery Exchange, Inc., New York, N. Y.
Simmons Machine Co., Inc., Albany, N. Y.

BORING AND TURNING MACHINES.
Baker Bros., Toledo, O.
Cincinnati Planer Co., Cincinnati, O.
Espen-Lucas Machine Works, Philadelphia, Pa.
Newton Mach. Tool Wks., Inc., Philadelphia.
Niles-Bement-Pond Co., New York, N. Y.
Simmons Machine Co., Inc., Albany, N. Y.
Toomey, Frank, Inc., Philadelphia, Pa.

BOX PRINTING DIES.
Moss, Henry, & Co., New York, N. Y.

BOX STRAPPING (Steel).
Acme Steel Goods Co., Chicago, Ill.

BOXES (Case-Hardening and Carbonizing).
Sivyer Steel Castings Co., Milwaukee, Wis.

BOXES (Cast Steel Open Hearth Charging).
Wellman-Seaver-Morgan Co., Cleveland, O.

BRAKES (Electric).
Cutler-Hammer Mfg. Co., The, Milwaukee.
Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Toledo Bridge & Crane Co., Toledo, O.

BRAKE SHOES.
Pittsburgh Iron & Steel Foundries Co., Pittsburgh, Pa.

BRANDING IRONS.
Moss, Henry, & Co., New York, N. Y.

BRASS AND BRONZE SIGNS AND TABLETS.
Moss, Henry, & Co., New York, N. Y.

BRASS AND COPPER.
Cleveland Brass & Copper Mills, Inc., Cleveland, O.

BRASS AND COPPER (Perforated).
Erdle Perforating Co., Rochester, N. Y.

BRASS GOODS.
Lunkenheimer Co., The, Cincinnati, O.
McKenna Brothers, Pittsburgh, Pa.

BRAZING OUTFITS.
Linde Air Products Co., New York, N. Y.
Oxweld Acetylene Co., Chicago, Ill.
Prest-O-Lite Co., The, Indianapolis, Ind.

BRICK (Fire-Proof Building).
Wagner Fire Brick Co., Scranton, Pa.

BRICK (Silica, Magnesia, Chrome).
American Refractories Co., Chicago, Ill.
Pyro Clay Products Co., The, Oak Hill, Ohio.
Soisson, Jos., Fire Brick Co., Connellsville, Pa.
Union Mining Co., Mount Savage, Md.

BRICK INSULATING (See Insulating Brick).

BRICKMAKING MACHINERY.
American Clay Machinery Co., Bucyrus, O.

BRIDGES, BUILDINGS AND VIADUCTS (Steel).
Alliance Structural Co., Alliance, O.
American Bridge Co., New York, N. Y.
Arnold Co., The, Chicago, Ill.
Austin Co., The, Cleveland, O.
Bellefontaine Bridge & Steel Co., The, Bellefontaine, O.
Lindsay, W. W., Co., Inc., Philadelphia.
McClintic-Marshall Co., Pittsburgh, Pa.
McMyler Interstate Co., Cleveland, O.
Mt. Vernon Bridge Co., Mt. Vernon, O.
Riter-Conley Mfg. Co., Pittsburgh, Pa.

BRIQUETTING.
General Briquetting Co., New York, N. Y.

BRUSHES (Dynamo).
Dixon, Jos., Crucible Co., Jersey City, N. J.

BROKERS (Customhouse, Marine and Insurance).
Grandfield, W. J., & Co., Philadelphia, Pa.

BRONZE.
Aluminum Castings Co., Cleveland.
Connecticut Brass Foundry Co., Inc., Waterbury, Conn.
Keystone Bronze Co., Pittsburgh, Pa.

BRONZE (Manganese).
Bethlehem Steel Co., The, So. Bethlehem, Pa.

BUCKETS (Clam Shell).
Hayward Company, The, New York City.
Lakewood Engrg. Co., Cleveland, O.
Wellman-Seaver-Morgan Co., Cleveland, O.
Williams, G. H., Co., Erie, Pa.

BUCKETS (Drag Line).
Hayward Company, The, New York City.

BUCKETS (Dumping).
Atlas Car & Mfg. Co., The, Cleveland, O.

BUCKETS (For All Purposes).
Blaw-Knox Co., Pittsburgh, Pa.

BUCKETS (Grab).
American Bridge Co., New York, N. Y.
Brown Hoisting Machy. Co., Cleveland, O.
Case Crane & Engineering Co., Columbus, O.
Hayward Company, The, New York City.
Industrial Works, Bay City, Mich.
Lakewood Engrg. Co., Cleveland, O.
Link-Belt Company, Chicago, Ill.
McMyler Interstate Co., Cleveland, O.
Orton & Steinbrenner Co., Chicago, Ill.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Wellman-Seaver-Morgan Co., Cleveland, O.
Williams, G. H., Co., Erie, Pa.

BUGGIES (Wire).
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BULLDOZERS.
Simmons Machine Co., Inc., Albany, N. Y.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

BUNDLES—SCRAP, WIRE AND ROD.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BURNERS (Acetylene).
Linde Air Products Co., New York, N. Y.
Oxweld Acetylene Co., Chicago, Ill.
Prest-O-Lite Co., The, Indianapolis, Ind.

BURNERS (Fuel Oil and Gas).
Gilbert & Barker Mfg. Co., Springfield, Mass.
Leetsdale Foundry & Mfg. Co., Leetsdale, Pa.

BUSHINGS.
Aluminum Castings Co., Cleveland.

BUSINESS CARDS (Engraved).
Wiggins, John B., Co., Chicago, Ill.

BY-PRODUCT COKE OVENS.
Koppers, H., Co., Pittsburgh, Pa.

CABLEWAYS AND TRAMWAYS.
American Steel & Wire Co., Chicago, Ill.
Brown Hoisting Machy. Co., Cleveland, O.
Macomber & Whyte Rope Co., Kenosha, Wis.
McClintic-Marshall Co., Pittsburgh, Pa.

CABLE WIRE.
Wright Wire Co., Worcester, Mass.

CANS (Waste, Shop and Oil).
New Britain Mach. Co., New Britain, Conn.

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Air-Tight Steel Tank Co.
PITTSBURGH, PA.

Tanks—High Pressure and Storage—Regular and Special to Order—Copper Brazed, Riveted or Welded—Gasoline Storage Tanks and Pumps—Structural and Machine Work.
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Plate Work riveted and welded
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Boilers; Stacks; Iron Castings

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Meadville, Pa.

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POWER PUMPS

Made for all pumping conditions. Capacities in standard sizes from 300 gallons to 130,000 gallons per hour. Special sizes built to order. Save from 40 to 60% over steam pumps. *Write for 192-page Catalogue.*

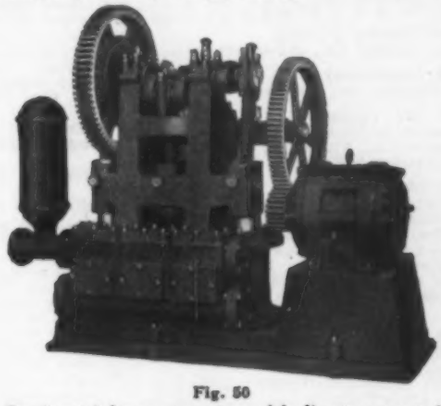


Fig. 50
Deming triplex power pump with direct connected electric motor.

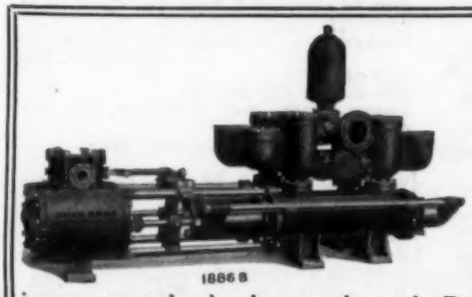
The Deming Company - Salem, Ohio

CHICAGO: Henion & Hubbell. PITTSBURGH: Harris Pump & Supply Co.
BUFFALO: Root, Neal & Co. NEW YORK: Ralph B. Carter Co.
BOSTON: Charles J. Jager Co., 15 Custom House St.

Agencies in all principal cities.

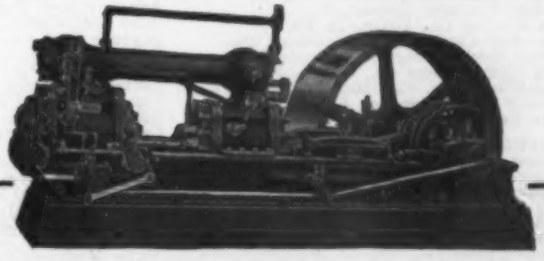
MACHINE TOOLS
Electric Travelling Cranes - Steam Hammers
NILES-BEMENT-POND CO.
GENERAL OFFICES, 111 BROADWAY, NEW YORK

BOSTON PHILADELPHIA BIRMINGHAM PITTSBURGH CINCINNATI CLEVELAND DETROIT CHICAGO ST. LOUIS SAN FRANCISCO



The valve movement of Dean Bros. **Durable Duplex Steam Pump** is the most important improvement that has been made on the Duplex Pump for twenty-five years. *Send for Catalog 103.*

DEAN BROS. STEAM PUMP WORKS. INDIANAPOLIS.
NOT IN THE PUMP TRUST



Automatic Selective Proportional Unloaders are found exclusively on the

NORWALK COMPRESSOR

These improvements mark a new era in compressor construction. They gain the instant and favorable attention of all skilled engineers.

For the usual hackneyed claims of ECONOMY, DURABILITY and EFFICIENCY, let our forty years' experience be an assurance of adequate and discerning attention to every feature.

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CARS (Industrial and Mining).
American Bridge Co., New York, N. Y.
American Steel Export Co., New York City.
Atlas Car & Mfg. Co., The, Cleveland, O.
Birdsboro St'l Fdy. & Mch. Co., Birdsboro, Pa.
Chase Fdy. & Mfg. Co., Columbus, O.
Lakewood Engrg. Co., Cleveland, O.
Lindsay, W. W., Co., Inc., Philadelphia.
Mesta Machine Co., Pittsburgh, Pa.
Treadwell Engineering Co., Easton, Pa.
Vulcan Steel Products Co., New York, N. Y.
Whiting Fdy. Equipment Co., Harvey, Ill.

CARS (Steel).
Cambria Steel Co., Philadelphia, Pa.

CASE HARDENING.
Bidle, W. S., Co., Cleveland, O.
Cleveland Metal Treating & Welding Co., Cleveland, O.
Co-operative Engineering Co., Inc., New York.
Williams, J. H., & Co., Brooklyn, N. Y.

CASE HARDENING BOXES.
Sivyer Steel Castings Co., Milwaukee, Wis.

CASTINGS (Aluminum).
Aluminum Castings Co., Cleveland.

CASTINGS (Air Furnace).
Buffalo Foundry & Mach. Co., Buffalo, N. Y.
Mesta Machine Co., Pittsburgh, Pa.
United Engineering & Fdy. Co., Pittsburgh, Pa.

CASTINGS (Alloy Steel).
American Vanadium Co., Pittsburgh, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Columbia Steel Co., San Francisco, Cal.
Sivyer Steel Casting Co., Milwaukee, Wis.
St. Louis Steel Foundry Co., St. Louis, Mo.
Strong Steel Foundry Co., Buffalo, N. Y.
Taylor-Wharton Iron & Steel Co., Highbridge, N. J.

CASTINGS (Brass, Bronze and Aluminum).
Aluminum Castings Co., Cleveland.
Brass Foundry Co., Peoria, Ill.
Bronzbraswyt Metals Co., Pittsburgh, Pa.
Connecticut Brass Foundry Co., Inc., Waterbury, Conn.
Co-operative Engineering Co., Inc., New York.
Keystone Bronze Co., Pittsburgh, Pa.
Klotz Machine Co., Sandusky, O.
Leetsdale Foundry & Mfg. Co., Leetsdale, Pa.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mitchell-Tappen Co., New York, N. Y.
Morgan Engineering Co., Alliance, O.
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

CASTINGS (Chilled).
Lehigh Car, Wheel & Axle Works, Catasauqua, Pa.
McLain's System, Inc., Milwaukee, Wis.

CASTINGS (Converter Steel).
Reading Steel Casting Co., Reading, Pa.
Sivyer Steel Casting Co., Milwaukee, Wis.
Smith, Geo. H., Steel Casting Co., Milwaukee.

CASTINGS (Crucible Steel).
Sivyer Steel Casting Co., Milwaukee, Wis.

CASTINGS (Die).
Co-operative Engineering Co., Inc., New York.
Lubricating Metal Co., The, New York City.
Strong Steel Foundry Co., Buffalo, N. Y.

CASTINGS (Electric Furnace).
Latrobe Electric Steel Co., Latrobe, Pa.
Pelton Steel Co., Milwaukee, Wis.
Racine Steel Castings Co., Racine, Wis.
Sivyer Steel Casting Co., Milwaukee, Wis.
Treadwell Engrg. Co., Easton, Pa.
United Alloys Steel Corp., The, Canton, O.

CASTINGS (Furnace).
Marshall Foundry Co., Pittsburgh, Pa.

CASTINGS (Gear).
Allyne-Ryan Foundry Co., Cleveland, O.
Dayton Steel Foundry Co., Dayton, O.
Link-Belt Company, Chicago, Ill.
Mesta Machine Co., Pittsburgh, Pa.
Sivyer Steel Casting Co., Milwaukee, Wis.
Standard Steel Castings Co., Cleveland, O.
Strong Steel Foundry Co., Buffalo, N. Y.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

CASTINGS (Grey Iron).
Adamson Machine Co., Akron, O.
Advance-Rumely Co., La Porte, Ind.
Allegheny Foundry & Machine Co., Glassmere, Pa.
American Bridge Co., New York, N. Y.
Arcade Mfg. Co., Freeport, Ill.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Birdsboro St'l Fdy. & Mch. Co., Birdsboro, Pa.
Brown Clutch Co., Sandusky, O.
Buffalo Fdy. & Machine Co., Buffalo, N. Y.
Caldwell & Drake Iron Works, Inc., Columbus, Ind.
Cascade Foundry Co., Erie, Pa.
Co-operative Engineering Co., Inc., New York.
Cyclops Foundry Co., Pittsburgh, Pa.
Davis, Charles E., Rutland, Vt.
Erie Foundry Co., Erie, Pa.
Farrel Foundry & Mach. Co., Ansonia, Conn.
Hamburg Plow Works, Hamburg, Pa.
Klotz Machine Co., Sandusky, O.
Lansing Foundry Co., The, Lansing, Mich.
Leetsdale Foundry & Mfg. Co., Leetsdale, Pa.
Link-Belt Company, Chicago, Ill.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Marshall Foundry Co., Pittsburgh, Pa.
Metals Production Equipment Co., New York.
Morgan Engineering Co., Alliance, O.
Murphy Foundry Co., Beaver Falls, Pa.
National Foundry Co., Erie, Pa.
North Buffalo Hdwe. Fdy. Co., Buffalo, N. Y.
North Manchester Foundry Co., North Manchester, Ind.
Overholt Machine Co., Seville, O.
Phoenix Iron Works Co., Meadville, Pa.
Portsmouth Stove & Range Co., Portsmouth, O.
Scranton Fdy. & Engine Works, New York.
Simpson Foundry Co., Newark, O.
Standard Engrg. Co., Ellwood City, Pa.
Standard Foundry Co., Buffalo, N. Y.
Stenzel Pattern Works, Houston, Tex.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
U. S. Cast Iron Pipe & Fdy. Co., Burlington, N. J.
Wellman-Seaver-Morgan Co., Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Williamson, J. E., Co., Bellwood, Pa.

CASTINGS (Malleable).
Acme Steel & Malleable Iron Works, Inc., Buffalo, N. Y.
Belle City Malleable Iron Co., Racine, Wis.
Columbus Malleable Iron Co., Columbus, O.
Co-operative Engineering Co., Inc., New York.
Danville Malleable Iron Co., Danville, Ill.
Dayton Malleable Iron Co., Dayton, O.
Decatur Malleable Iron Co., Decatur, Ill.
Erie Malleable Iron Co., Erie, Pa.
Fanner Manufacturing Co., Cleveland, O.
Frazer & Jones Co., Syracuse, N. Y.
Hammond Malleable Iron Co., Hammond, Ind.
Illinois Malleable Iron Co., Chicago, Ill.
Lakeside Malleable Castings Co., Racine, Wis.
Link-Belt Company, Chicago, Ill.
Mal-Gra Castings Co., Cambridge City, Ind.
Marion Malleable Iron Works, Marion, Ind.
Missouri Malleable Iron Co., E. St. Louis, Ill.
Moline Malleable Iron Co., St. Charles, Ill.
National Malleable Castings Co., Cleveland, O.
Northwestern Malleable Iron Co., Milwaukee, Wis.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Pittsburgh Valve, Foundry & Const. Co., Pittsburgh, Pa.
Richmond Malleable Castings Co., Richmond, Ind.
Ross-Meehan Foundries, Chattanooga, Tenn.
Saginaw Malleable Iron Co., Saginaw, Mich.
Standard Malleable Iron Co., Muskegon, Mich.
Vermilion Malleable Iron Co., Hoopeston, Ill.
Wisconsin Malleable Iron Co., Milwaukee, Wis.
Zanesville Malleable Iron Co., Zanesville, O.

CASTINGS (Open Hearth).
Atlas Steel Casting Co., Buffalo, N. Y.
Columbia Steel Co., San Francisco, Cal.
Wellman-Seaver-Morgan Co., Cleveland, O.

CASTINGS (Semi-Steel).
Adamson Machine Co., Akron, O.
Advance-Rumely Co., La Porte, Ind.
Allyne-Ryan Fdy. Co., Cleveland, O.
Buffalo Fdy. & Mach. Co., Buffalo, N. Y.
Cincinnati Steel Castings Co., Cincinnati, O.
Morgan Engineering Co., Alliance, O.
Murphy Foundry Co., Beaver Falls, Pa.
Pittsburgh Piping & Equip. Co., Pittsburgh.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

CASTINGS (Steel).
Adamson Machine Co., Akron, O.
American Bridge Co., New York City.
American Steel Foundries, Chicago, Ill.
Atlas Steel Casting Co., Buffalo, N. Y.
Bayonne Steel Casting Co., Bayonne, N. J.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Birdsboro St'l Fdy. & Mch. Co., Birdsboro, Pa.
Burnside Steel Co., Chicago.
Cincinnati Steel Castings Co., Cincinnati, O.
Columbia Steel Co., San Francisco, Cal.
Connecticut Electric Steel Co., Inc., Hartford, Conn.
Dayton Steel Foundry, Dayton, O.
Farrell-Cheek Steel Foundry Co., Sandusky, O.
Federal Steel Foundry Co., Chester, Pa.
Hubbard Steel Foundry Co., E. Chicago, Ind.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
McCord & Co., Chicago, Ill.
Mesta Machine Co., Pittsburgh, Pa.
Midvale Steel Co., Philadelphia, Pa.
Morgan Engineering Co., Alliance, O.
National Foundry Co., Erie, Pa.
National Malleable Castings Co., Cleveland, O.
National Roll & Foundry Co., Avonmore, Pa.
Otis Steel Co., Cleveland, O.
Pittsburgh Iron & Steel Foundries Co., Pittsburgh, Pa.
Reading Steel Casting Co., Reading, Pa.
Reliance Steel Casting Co., Pittsburgh, Pa.
Ross-Meehan Foundries, Chattanooga, Tenn.
Sharon Foundry Co., Sharon, Pa.
Sivyer Steel Casting Co., Milwaukee, Wis.
Smith, Geo. H., Steel Casting Co., Milwaukee, Wis.
Standard Steel Castings Co., Cleveland, O.
St. Louis Steel Foundry Co., St. Louis, Mo.
Strong Steel Foundry Co., Buffalo, N. Y.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.
West Steel Casting Co., Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.

CASTINGS (Steel, for Electrical Apparatus).
Burnside Steel Co., Chicago.
Dayton Steel Foundry, Dayton, O.
National Malleable Castings Co., Cleveland, O.
Sivyer Steel Castings Co., Milwaukee, Wis.
Smith, Geo. H., Steel Casting Co., Milwaukee, Wis.
Strong Steel Foundry Co., Buffalo, N. Y.
West Steel Casting Co., Cleveland, O.

CASTINGS (Stellite).
Haynes Stellite Co., The, Kokomo, Ind.

CASTINGS (White Metal).
Bronzbraswyt Metals Co., Pittsburgh, Pa.

CEMENT (Fire Brick).
Botfield Specialties Co., Philadelphia.

CEMENT (Furnace, High Temperature).
Quigley Furnace Specialties Co., New York, N. Y.

CEMENT MACHINERY.
Vulcan Iron Works, Wilkes-Barre, Pa.

CEMENT WATERPROOFING.
Texas Company, The, New York City.

CENTRAL STATION EQUIPMENT.
General Electric Co., Schenectady, N. Y.
Smith Gas Engrg. Co., The, Lexington, O.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CENTRIFUGAL COAL DRIERS.
Link-Belt Company, Chicago, Ill.

CHAIN DRIVES.
Link-Belt Company, Chicago, Ill.

CHAIN MACHINERY (Coil Chain).
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

CHAINS.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Link-Belt Company, Chicago, Ill.
McKay, James Co., Pittsburgh, Pa.

CHAINS (Conveyer).
Link-Belt Company, Chicago, Ill.

CHAINS (Power Transmitting).
Link-Belt Company, Chicago, Ill.

CHANNELS (See Steel Structural).

CHAPLETS.
Champion Mch. & Forging Co., Cleveland, O.
Fanner Mfg. Co., Cleveland, O.
Lindsay, W. W., Co., Inc., Philadelphia.

CHARCOAL.
Hillman, J. H., & Sons Co., Pittsburgh, Pa.

CHARCOAL CARS.
Lakewood Engrg. Co., Cleveland, O.

CHARGING BUGGY.
Lakewood Engrg. Co., Cleveland, O.

CHECKS (Time, Tool and Pay).
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Moss, Henry, & Co., New York, N. Y.
Pannier Bros. Stamp Co., Pittsburgh, Pa.

CHEMICAL APPARATUS.
Buffalo Foundry & Mach. Co., Buffalo, N. Y.

CHEMICALS.
Ele-Kem Co., Chicago, Ill.
Ford, J. B., Co., Wyandotte, Mich.

CHEMISTS AND METALLURGISTS.
Bidle Co., W. S., Cleveland, O.
Hunt, Robt. W., Co., Chicago, Ill.
Steel Improvement & Forge Co., Cleveland, O.

CHROME ORE.
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.

CHUCKS.
Modern Tool Co., Erie, Pa.
Toomey, Frank, Inc., Philadelphia, Pa.

CHUCKS (Drill).
Clark Equipment Co., Buchanan, Mich.

CHUCKS (Lathe).
Whiton, D. E., Mch. Co., New London, Conn.

CINDER MILLS (Water).
Whiting Foundry Equipment Co., Harvey, Ill

CINDER POTS.
Marshall Foundry Co., Pittsburgh, Pa.

CIRCUIT BREAKERS.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CLAMPS ("C").
Williams, J. H., & Co., Brooklyn, N. Y.

CLAY MACHINERY.
American Clay Machinery Co., Bucyrus, O.
Stevenson Co., The, Wellsville, O.

CLEANER (Metal).
Ford, J. B., Co., Wyandotte, Mich.

See Index to Advertisements for Pages Containing Advertisements of Companies Listed Above

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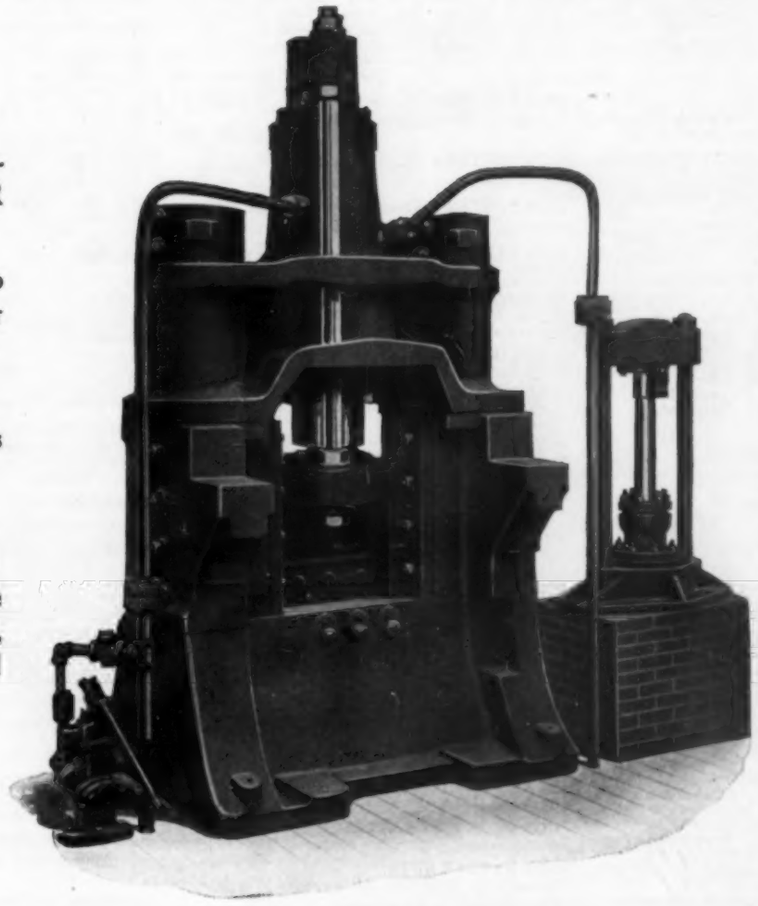
500-Ton Hydraulic Billet Shear Cuts 2 Billets in 1 Operation



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Jogglers
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Etc.

This is our latest type heavy HYDRAULIC BILLET SHEAR of solid cast steel construction, designed for cutting two 6" square billets at one time.

Equipped with knives 24" long, the machine has a stroke of 10", and the pull back is operated under a pressure of 650 pounds. The forged steel columns extend through the housing.

Machine is Operated by a Steam Hydraulic Intensifier.

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Carlyle Johnson Mch. Co., Manchester, Conn.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Link-Belt Company, Chicago, Ill.
Wellman-Seaver-Morgan Co., Cleveland, O.

CLUTCHES (Couplings).
Carlyle Johnson Mach. Co., Manchester, Conn.

CLUTCHES (Friction).
Carlyle Johnson Mch. Co., Manchester, Conn.
Plamondon, A., Mfg. Co., Chicago, Ill.

COAL.
Addy, Matthew, Co., The, Cincinnati, O.
Alden Coal Mining Co., New York City.
Baird & West, Detroit, Mich.
Bixler Coal & Coke Co., Pittsburgh, Pa.
Eaton, Rhodes & Co., Cincinnati, O.
Fobewood Coal & Iron Co., Pittsburgh, Pa.
Hanna, M. A., & Co., Cleveland, O.
Hillman, J. H., & Sons Co., Pittsburgh, Pa.
Mudge, Edmund W., & Co., Pittsburgh, Pa.
Reilly-Peabody Fuel Co., Pittsburgh, Pa.
Rogers, Brown & Co., Cincinnati, O.
Semet-Solvay Co., Syracuse, N. Y.
Snyder, W. P., Co., Pittsburgh, Pa.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Washington Coal & Coke Co., Dawson, Pa.

COAL CRUSHERS AND PULVERIZERS.
Lehigh Car, Wheel & Axle Works, Catasauqua, Pa.
Link-Belt Company, Chicago, Ill.
Orton & Steinbrenner Co., Chicago, Ill.
Raymond Bros. Impact Pulverizer Co., The, Chicago, Ill.

COAL, ORE AND ASH HANDLING MACHINERY.
American Bridge Co., New York, N. Y.
Blaw-Knox Co., Pittsburgh, Pa.
Brown Hoisting Machy. Co., Cleveland, O.
Hayward Company, The, New York City.
Link-Belt Company, Chicago, Ill.
Orton & Steinbrenner Co., Chicago, Ill.
Wellman-Seaver-Morgan Co., Cleveland, O.

COAL TIPPLES.
Link-Belt Company, Chicago, Ill.

COAL WASHERS.
Link-Belt Company, Chicago, Ill.

COILING MACHINERY.
Sleeper & Hartley, Inc., Worcester, Mass.

COILS (Pipe).
Pittsburgh Piping & Equip. Co., Pittsburgh.
Roessing-Ernst Co., Etna, Pittsburgh, Pa.

COKE.
Addy, Matthew, Co., The, Cincinnati, O.
Alden Coal Mining Co., New York City.
Baird & West, Detroit, Mich.
Bixler Coal & Coke Co., Pittsburgh, Pa.
Bourne-Fuller Co., Cleveland, O.
Crocker Bros., New York City.
Eaton, Rhodes & Co., Cincinnati, O.
Fobewood Coal & Iron Co., Pittsburgh, Pa.
Hanna, M. A., & Co., Cleveland, O.
Hillman, J. H., & Sons Co., Pittsburgh, Pa.
McKeefrey & Co., Leetonia, O.
Mohr, J. J., & Son, Philadelphia, Pa.
Mudge, Edmund W., & Co., Pittsburgh, Pa.
Reilly-Peabody Fuel Co., Pittsburgh, Pa.
Rogers, Brown & Co., Cincinnati, O.
Semet-Solvay Co., Syracuse, N. Y.
Snyder, W. P., & Co., Pittsburgh, Pa.
Stewart Iron Co., Ltd., Cleveland, O.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Washington Coal & Coke Co., Dawson, Pa.

COKE OVEN MACHINERY.
Wellman-Seaver-Morgan Co., Cleveland, O.

COKE OVENS (By-Product).
Koppers, H., Co., Pittsburgh, Pa.

COLD ROLLED MATERIAL.
Vulcan Steel Products Co., New York, N. Y.

COMPRESSORS (Air).
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Norwalk Iron Works Co., So. Norwalk, Conn.
Southwark Foundry & Mach. Co., Philadelphia.
Standard Scale & Supply Co., Pittsburgh, Pa.
Wickes Brothers, Saginaw, Mich.

COMPRESSORS (Gas).
Norwalk Iron Works Co., So. Norwalk, Conn.

CONCRETE INSERTS.
Dayton Malleable Iron Co., Dayton, O.

CONCRETE MIXERS.
Blystone Mfg. Co., Cambridge Springs, Pa.
Lakewood Engrg. Co., Cleveland, O.
Standard Scale & Supply Co., Pittsburgh, Pa.

CONCRETE REINFORCEMENT.
American Steel & Wire Co., Chicago, Ill.

CONDENSERS.
Buffalo Fdy. & Machine Co., Buffalo, N. Y.
Connersville Blower Co., The, Connersville, Ind.
Cooper, C. & G., Mt. Vernon, O.
Dean Bros. Steam Pump Works, Indianapolis.
Mesta Machine Co., Pittsburgh, Pa.

CONDUCTORS (Armored Electric).
Youngstown Sheet & Tube Co., Youngstown, O.

CONDUITS (Electrical).
Youngstown Sheet & Tube Co., Youngstown, O.

CONTRACTORS (See Engineers and Contractors).

CONTRACTORS EQUIPMENT.
Lakewood Engrg. Co., Cleveland, O.

CONTROLLERS (Electric).
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Morgan Engineering Co., Alliance, O.
Toledo Bridge & Crane Co., Toledo, O.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CONVERTERS (Bessemer).
Pennsylvania Engineering Works, New Castle, Pa.

CONVERTERS (High Speed Steel).
Onondaga Steel Co., Syracuse, N. Y.

CONVERTERS (Steel Castings).
Whiting Foundry Equipment Harvey, Ill.

CONVEYORS (Elevating and Conveying).
Brown Hoisting Machinery Co., Cleveland, O.
Link-Belt Company, Chicago, Ill.
McMyler Interstate Co., Cleveland, O.
Roots, P. H., & F. M., Co., Connersville, Ind.
Vulcan Iron Works, Wilkes-Barre, Pa.

COOLING BEDS.
Treadwell Engineering Co., Easton, Pa.

COPPER.
United Smelting & Aluminum Co., New Haven, Conn.

COPPER (Boronic Alloy in Shot Form).
American Boron Products Co., Inc., Reading, Pa.

COPPER ALUMINUM (Boronic Alloy in Shot Form).
American Boron Products Co., Inc., Reading, Pa.

COPPER NICKEL (Boronic Alloy in Shot Form).
American Boron Products Co., Inc., Reading, Pa.

CORE MAKING MACHINES.
Pridmore, Henry E., Chicago, Ill.

CORE OVENS.
Metals Production Equipment Co., New York.
Whiting Fdy. Equipment Co., Harvey, Ill.

CORE OVEN CARS.
Lakewood Engrg. Co., Cleveland, O.

CORE REDUCERS.
National Engineering Co., Chicago.

CORRUGATED FASTENERS.
Acme Steel Goods Co., Chicago, Ill.

COUNTERSHAFTS.
Kempsmith Mfg. Co., Milwaukee, Wis.

COUNTING MACHINES.
Hart, R. A., Mfg. Co., Battle Creek, Mich.

COUPLING BOXES.
Pittsburgh Iron & Steel Foundries, Pittsburgh, Pa.

COUPLINGS.
American Vanadium Co., The, Pittsburgh, Pa.
Connersville Blower Co., The, Connersville, Ind.
Mark Mfg. Co., Evanston, Ill.
Roots, P. H., & F. M., Co., Connersville, Ind.

COUPLINGS (Carriage).
Bradley, C. C., & Son, Inc., Syracuse, N. Y.

CRANES.
New York Machinery Exchange, Inc., New York, N. Y.

CRANES (Charging).
Alliance Machine Co., Alliance, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York, N. Y.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Wellman-Seaver-Morgan Co., Cleveland, O.

CRANES (Electric).
Case Crane & Engrg. Co., The, Columbus, O.
Link-Belt Company, Chicago, Ill.
Mitchell-Tappen Co., New York, N. Y.
Morgan Engineering Co., Alliance, O.
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES (Electric Traveling).
Alliance Machine Co., Alliance, O.
Brown Hoisting Machinery Co., Cleveland, O.
Chesapeake Iron Works, Baltimore, Md.
Cleveland Crane & Engineering Co., Wickliffe, O.
Euclid Crane & Hoist Co., Euclid, O.
Milwaukee Electric Crane & Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York, N. Y.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Shaw Electric Crane Co., New York, N. Y.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Toledo Bridge & Crane Co., Toledo, O.

CRANES (Hand).
Brown Hoisting Machinery Co., Cleveland, O.
Case Crane & Engrg. Co., The, Columbus, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Euclid Crane & Hoist Co., Euclid, O.
Link-Belt Company, Chicago, Ill.
Milwaukee Electric Crane & Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York, N. Y.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Toledo Bridge & Crane Co., Toledo, O.
Whiting Foundry Equipment Co., Harvey, Ill.

CRANES (Hydraulic).
Alliance Machine Co., Alliance, O.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Morgan Engineering Co., Alliance, O.
Ridgway, Craig, & Son, Coatesville, Pa.
Southwark Foundry & Mach. Co., Philadelphia.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

CRANES (Jib).
Case Crane & Engineering Co., Columbus, O.

CRANES (Locomotive).
Brown Hoisting Machinery Co., Cleveland, O.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Industrial Works, Bay City, Mich.
Link-Belt Company, Chicago, Ill.
McMyler Interstate Co., Cleveland, O.
Milwaukee Electric Crane & Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York City, N. Y.
Orton & Steinbrenner Co., Chicago, Ill.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Shaw Electric Crane Co., New York, N. Y.

CRANES (Pillar).
Northern Engineering Works, Detroit, Mich.

CRANES (Steam Cleaning House).
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

CRANES (Steam and Pneumatic, Wire Mills).
Cleveland Crane & Engrg. Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

CRANK SHAFTS.
Bay City Forge Co., Erie, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Williams, J. H., & Co., Brooklyn, N. Y.

CRUCIBLES.
Century Steel Co. of America, New York.
Dixon, Jos., Crucible Co., Jersey City, N. J.

CRUSHER JAWS AND ROLLS.
Pittsburgh Iron & Steel Foundries Co., Pittsburgh, Pa.

CRUSHING MACHINERY.
Lehigh Car, Wheel & Axle Works, Catasauqua, Pa.
Link-Belt Company, Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.

CUPOLA BLOCKS.
Mutton Hollow Fire Brick Co., The, Woodbridge, N. J.
Wagner Fire Brick Co., Scranton, Pa.

CUPOLA, FURNACE AND FORGE LINING See Linings (Cupola, Furnace and Forge).

CUPOLA PRACTICE.
McLain's System, Inc., Milwaukee, Wis.

CUPOLAS.
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

CUPRO-VANADIUM.
American Vanadium Co., Pittsburgh, Pa.

CUPS (Oil, Grease, Etc.).
National Malleable Castings Co., Cleveland, O.

CUTTERS (Keyway).
Morton Mfg. Co., Muskegon Heights, Mich.

CUTTERS (Pipe).
Hunter Saw & Machine Co., Pittsburgh.

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CHIPPING HAMMERS *and* FOUNDRY RAMMERS

Made in several sizes, suitable for all classes of work.

Used by many of the principal steel mills and foundries.

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SAND-BLAST SPECIALISTS

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Saves Air Time and Temper

Tight Under all Pressures

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STATIONARY **MACHINES** Patented

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THE PORTAGE SILICA CO
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"Indispensable" equipment in more than 1,000 leading foundries for core and facing sand. Blystone Mix is the most thorough in existence.

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Cleveland CRUCIBLE CONVERTED

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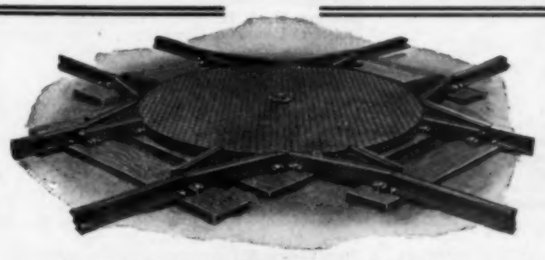

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AMERICAN-WADSWORTH PRESSURE SAND BLAST APPARATUS

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52 VANDER BILT AVE. NEW YORK

CUTTERS (Stellite).
Haynes Stellite Co., The, Kokomo, Ind.

CUTTERS, LINK (Coil Chain).
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

CUTTING AND WELDING (Oxy-Acetylene Process).
Linde Air Products Co., New York.
Oxweld Acetylene Co., Chicago, Ill.
Prest-O-Lite Co., The, Indianapolis, Ind.

CUTTING AND WELDING APPARATUS (Electric).
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CUTTING OFF MACHINES.
Birdsboro St'l Fdy. & Mch. Co., Birdsboro, Pa.
Cleveland Punch & Shear Works Co., Cleveland, O.
Espen-Lucas Machine Works, Philadelphia, Pa.
Newton Mach. Tool Wks., Inc., Philadelphia.
New York Machinery Exchange, Inc., New York, N. Y.
Peerless Machine Co., Racine, Wis.
Racine Tool & Machine Co., Racine, Wis.
Southwark Fdy. & Mch. Co., Philadelphia, Pa.
Toomey, Frank, Inc., Philadelphia, Pa.

CYANIDE HARDENING COMPOUND.
Ele-Kem Co., Chicago, Ill.
Park Chemical Co., Detroit, Mich.

CYANIDE POTS.
Sivyer Steel Castings Co., Milwaukee, Wis.

CYLINDERS.
National Tube Co., Pittsburgh, Pa.

CYLINDERS (Pressure).
National Tube Co., Pittsburgh.

DELIVERY TRUCKS.
Federal Motor Truck Co., Detroit, Mich.

DEOXIDIZERS (Boronic in Shot Form).
American Boron Products Co., Inc., Reading, Pa.

DERRICKS AND FITTINGS.
American Bridge Co., New York, N. Y.
Case Crane & Engineering Co., Columbus, O.
Dake Engine Co., Grand Haven, Mich.
Hayward Company, The, New York City.
Williams, G. H., Co., Erie, Pa.

DIE BLOCKS.
Heppenstall Forge & Knife Co., Pittsburgh, Pa.

DIES.
American Vanadium Co., The, Pittsburgh, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Buffalo Fdy. & Mch. Co., Buffalo, N. Y.
Co-operative Engineering Co., Inc., New York.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Lansing Stamping & Tool Co., Lansing, Mich.
Modern Tool Co., Erie, Pa.
Pittsburgh Iron & Steel Foundries Co., Pittsburgh, Pa.
Sivyer Steel Casting Co., Milwaukee, Wis.
Toledo Machine & Tool Co., Toledo, O.

DIES (For Special Shapes).
Empire Art Metal Co., College Pt., N. Y.

DIES (Lettering and Embossing).
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Moss, Henry, & Co., New York, N. Y.
Pannier Bros. Stamp. Co., Pittsburgh, Pa.

DIES (Pipe Threading).
Treadwell Engineering Co., Easton, Pa.

DIGGING AND EXCAVATING MACHINERY.
Blaw-Knox Co., Pittsburgh, Pa.
Hayward Company, The, New York City.
Williams, G. H., Co., Erie, Pa.

DOLOMITE (Dead Burned).
Davison, Allen S., Company, Pittsburgh, Pa.

DOORS (Hollow Steel).
Empire Art Metal Co., College Pt., N. Y.

DOORS AND SHUTTERS (Steel Rolling).
Edwards Mfg. Co., The, Cincinnati, O.

DRAW BENCHES.
Treadwell Engineering Co., Easton, Pa.

DRAWING TABLES.
Economy Drawing Table Co., Toledo, O.
Hein Furniture Co., The, Toledo, O.

DRILLING MACHINES.
Allen, John F., Co., New York, N. Y.
Baker Bros., Toledo, O.
Cleveland Pneumatic Tool Co., Cleveland, O.
Milwaukee Electric Crane & Mfg. Co., Milwaukee, Wis.
National Machine Co., The, Tiffin, O.
New York Machinery Exchange, Inc., New York, N. Y.
Newton Mach. Tool Wks., Inc., Philadelphia.
Niles-Bement-Pond Co., New York, N. Y.
Simmons Machine Co., Inc., Albany, N. Y.
Simplex Mach. Tool Co., The, Hamilton, O.
Toomey, Frank, Inc., Philadelphia, Pa.

DRILLS.
American Vanadium Co., The, Pittsburgh, Pa.
Clark Equipment Co., Buchanan, Mich.
Latrobe Tool Co., The, Latrobe, Pa.
Newton Mach. Tool Works, Inc., Philadelphia.
Simmons Machine Co., Inc., Albany, N. Y.
Toomey, Frank, Inc., Philadelphia, Pa.
Wickes Brothers, Saginaw, Mich.

DRILLS (Rock).
Wickes Brothers, Saginaw, Mich.

DRILLS (Twist).
Clark Equipment Co., Buchanan, Mich.

DRIVES (Rope and Gear).
Treadwell Engineering Co., Easton, Pa.

DRYERS.
Machinery Utilities Co., New York, N. Y.

DRYERS (Ore).
Lehigh Car, Wheel & Axle Works, Catasauqua, Pa.

DRYERS (Vacuum).
Buffalo Foundry & Mach. Co., Buffalo, N. Y.

DRY PANS.
Stevenson Co., The, Wellsville, O.

DUST ARRESTING SYSTEMS.
Hoevel Mfg. Corporation, New York City.
Pangborn Corporation, Hagerstown, Md.
Whiting Foundry Equipment Co., Harvey, Ill.

ELECTRICAL EQUIPMENT.
Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.

ELECTRIC LIGHT EQUIPMENT.
Link-Belt Company, Chicago, Ill.
Smith Gas Engrg. Co., The, Lexington, O.

ELECTRIC MACHINERY (Second Hand).
Carrell & Co., W. A., Pittsburgh, Pa.
Miller-Owen Electric Co., Pittsburgh, Pa.
Nathan Klein & Co., Inc., New York City.
Power Equipment Co., Philadelphia, Pa.
Steam & Electrical Machinery Co., Bay City, Mich.

ELEVATORS.
Ridgway, Craig & Son, Coatesville, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

ELEVATORS (Bucket).
Link-Belt Company, Chicago, Ill.

ELEVATORS (Hydraulic).
Ridgway, Craig, & Son, Coatesville, Pa.

ENAMEL SIGNS.
Moss, Henry, & Co., New York, N. Y.

ENGINE LATHES.
Bridgeford Mch. Tool Wks., Rochester, N. Y.
New York Machinery Exchange, Inc., New York, N. Y.
Toomey, Frank, Inc., Philadelphia, Pa.

ENGINEERS AND CONTRACTORS.
Abramsen Engineering Co., Pittsburgh, Pa.
Alliance Structural Co., Alliance, O.
American Bridge Co., New York City.
Arnold Co., The, Chicago, Ill.
Austin Co., The, Cleveland, O.
Ayer & Lord Tie Co., Chicago.
Barns Safe & Lock Co., Pittsburgh, Pa.
Blair Engineering Co., Chicago, Ill.
Case Crane & Engrg. Co., The, Columbus, O.
Chesapeake Iron Works, Baltimore, Md.
Demorest, George, M., Pittsburgh, Pa.
Freyn & Co., Chicago, Ill.
General Briquetting Co., New York City.
Hunt, Robert W., & Co., Chicago, Ill.
Kennedy, Julian, Pittsburgh, Pa.
Kratzer, W. N., & Co., Pittsburgh, Pa.
Laughlin, Alex., & Co., Pittsburgh, Pa.
McClintic-Marshall Co., Pittsburgh, Pa.
McClure, Geo. W., Sons & Co., Pittsburgh, Pa.
McKee, Arthur G., & Co., Cleveland, O.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Pittsburgh Pip'g & Equipment Co., Pittsburgh.
Rinehart, J. W., Cleveland, O.
Smythe, S. R., The, Co., Pittsburgh, Pa.
Swindell, Wm., & Bros., Pittsburgh, Pa.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

ENGINEERS (Chemical).
Buffalo Foundry & Mach. Co., Buffalo, N. Y.

ENGINEERS (Consulting).
Arnold Co., The, Chicago, Ill.
Austin Co., The, Cleveland, O.
Duff, Samuel E., Pittsburgh, Pa.
Ellis, Frank I., Pittsburgh, Pa.
Freyn & Co., Chicago, Ill.
General Briquetting Co., New York, N. Y.
Kennedy, Julian, Pittsburgh, Pa.
Moore, Frederick C., Cleveland, O.
Moore, W. E., & Co., Pittsburgh, Pa.
Shover, Barton R., Pittsburgh, Pa.
Vulcan Steel Products Co., New York, N. Y.

ENGINEERS (Foundry, Mechanical and Electrical).
General Briquetting Co., New York City.
Standard Sand & Mch. Co., Cleveland, O.

ENGINEERS (Metallurgical).
American Incandescent Heat Co., Boston.

ENGINES (Gas, Gasoline and Oil).
Cooper, C. & G., Co., Mt. Vernon, O.
Machinery Utilities Co., New York, N. Y.
Mesta Machine Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

ENGINES (Hoisting).
Dake Engine Co., Grand Haven, Mich.
Vulcan Iron Works, Wilkes-Barre, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.

ENGINES (Marine).
Carlyle Johnson Mach. Co., Manchester, Conn.
Scranton Fdy. & Engine Works, N. York.

ENGINES (Steam).
Cooper, C. & G., Co., Mt. Vernon, O.
Dake Engine Co., Grand Haven, Mich.
Machinery Utilities Co., New York, N. Y.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Phoenix Iron Works Co., Meadville, Pa.
Standard Scale & Supply Co., Pittsburgh, Pa.
Toomey, Frank, Inc., Philadelphia, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

ENGRAVERS (Steel and Copper Plate).
Wiggins, John B., Co., Chicago, Ill.

ENGRAVERS (Steel, Die and Stamp).
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Moss, Henry, & Co., New York, N. Y.

EXCAVATING MACHINERY.
Blaw-Knox Co., Pittsburgh, Pa.
Hayward Company, The, New York City.
Lakewood Engrg. Co., Cleveland, O.

EXHAUSTERS (Gas).
Connersville Blower Co., The, Connersville, Ind.
Roots, P. H. & F. M., Co., Connersville, Ind.

EXPORTERS.
American Steel Export Co., New York.
Federal Export Corporation, New York.
Ford, R. M., & Co., Inc., New York, N. Y.
Liberty Steel Products Co., New York.
Vulcan Steel Products Co., New York, N. Y.

EYEBARS.
American Bridge Co., New York, N. Y.

FACINGS (Foundry).
Dixon, Jos., Crucible Co., Jersey City, N. J.

FENCE GATES.
American Steel & Wire Co., Chicago, Ill.

FENCE POSTS (Creosoted).
Ayer & Lord Tie Co., Chicago.

FENCING (Woven Wire).
Interstate Iron & Steel Co., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

FERRO-ALLOYS.
Davison, Allen S., Co., Pittsburgh, Pa.
Fairbanks, Morse & Co., New York City.
Southern Ferro Alloys Co., Chattanooga, Tenn.
U. S. Alloys Corporation, New York City.

FERRO-CARBON TITANIUM.
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

FERRO-MANGANESE.
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.
Crocker Bros., New York City.
Mohr, J. J., & Sons, Philadelphia, Pa.
Rogers, Brown & Co., Cincinnati, O.
Samuel, Frank, Philadelphia, Pa.

FERRO-SILICON.
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.
Crocker Bros., New York City.
Davison, Allen S., Company, Pittsburgh, Pa.
Fairbanks, Morse & Co., New York.
Globe Iron Co., Jackson, O.
Mohr, J. J., & Sons, Philadelphia, Pa.
Rogers, Brown & Co., Cincinnati, O.
Samuel, Frank, Philadelphia, Pa.
Southern Ferro Alloys Co., Chattanooga, Tenn.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Alloys Corporation, New York City.

FERRO-TUNGSTEN.
Fairbanks, Morse & Co., New York City.
Vanadium Alloys Steel Co., Pittsburgh, Pa.

FERRO-VANADIUM.
American Vanadium Co., Pittsburgh, Pa.

FILES.
Barnett, G. & H., Co., Philadelphia, Pa.
Disston, Henry & Sons, Inc., Philadelphia.
Nicholson File Co., Providence, R. I.

FIRE BRICK AND CLAY.
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.
Brighton Fire Brick Co., New Brighton, Pa.
Clearfield Fire Brick Co., Clearfield, Pa.
Eureka Fire Brick Works, Mt. Braddock, Pa.
Federal Terra Cotta Co., New York, N. Y.
Kier Fire Brick Co., Pittsburgh, Pa.
Louisville Fire Brick Co., Highland Park, Ky.
Mutton Hollow Fire Brick Co., The, Woodbridge, N. J.
Pope, Frank B., Pittsburgh, Pa.
Portsmouth Refractories Co., Portsmouth, O.
Pyro Clay Products Co., The, Oak Hill, Ohio.
Queens Run Fire Brick Co., Lock Haven, Pa.
Sharon Fire Brick Co., Sharon, Pa.
Soisson, Jos., Fire Brick Co., Connellsville, Pa.
Union Mining Co., Mt. Savage, Md.
Wagner Fire Brick Co., Scranton, Pa.

FIRE BRICK CEMENT.
Botfield Specialties Co., Philadelphia.

FIRE CLAY (Ground).
Union Mining Co., Mt. Savage, Md.

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Wheeler & Holcomb Co., Chicago.

FLANGES (Pipe).
Dart, E. M., Mfg. Co., Providence, R. I.
Pittsburgh Piping & Equip. Co., Pittsburgh.

FLAT WIRE—HIGH AND LOW CARBON.
American Steel & Wire Co., Chicago, Ill.

FLOORING (Creosoted Wood).
Ayer & Lord Tie Co., Chicago, Ill.

FLUE CUTTERS.
Clark Equipment Co., Buchanan, Mich.

FLUE WELDERS.
Southwark Foundry & Mach. Co., Philadelphia.

FLUOR-SPAR.
Rogers, Brown & Co., Cincinnati, O.

FLUXES (Boronic in Shot Form).
American Boron Products Co., Inc., Reading, Pa.

FLY WHEELS.
Mesta Machine Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

FORGES.
Bradley, C. C., & Son, Inc., Syracuse, N. Y.

FORGING MACHINERY.
Bliss, E. W., Co., Brooklyn, N. Y.
Erie Foundry Co., The, Erie, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Simmons Machine Co., Inc., Albany, N. Y.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

FORGING (Drop).
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Champion Mch. & Forging Co., Cleveland, O.
Columbus Forge & Iron Co., Columbus, O.
Co-operative Engineering Co., New York.
Drop Forging Co. of N. Y., Jersey City, N. J.
Eccles, Richard, Co., Auburn, N. Y.
General Drop Forge Co., Buffalo, N. Y.
Ingalls-Shepard Forging Co., Chicago, Ill.
Lakeside Forge Co., Erie, Pa.
McKay, James Co., Pittsburgh, Pa.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Rockford Drop Forge Co., Rockford, Ill.
Scranton Forging Co., Scranton, Pa.
Steel Car Forge Co., Pittsburgh, Pa.
Williams, J. H., & Co., Brooklyn, N. Y.

FORGINGS (Iron and Steel).
Aborn Steel Co., Inc., New York, N. Y.
American Bridge Co., New York, N. Y.
American Rolling Mill Co., Middletown, O.
American Steel Export Co., New York City.
American Vanadium Co., The, Pittsburgh, Pa.
Bay City Forge Co., Erie, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bradley, C. C., & Son, Inc., Syracuse, N. Y.
Carnegie Steel Co., Pittsburgh, Pa.
Champion Mch. & Forging Co., Cleveland, O.
Columbus Forge & Iron Co., Columbus, O.
Cruse-Crawford Manufacturing Co., Birmingham, Ala.
Drop Forging Co. of N. Y., Jersey City, N. J.
Eccles, Richard, Co., Auburn, N. Y.
Heppenstall Forge & Knife Co., Pittsburgh, Pa.
Ingalls-Shepard Forging Co., Chicago, Ill.
Joliet Forge Co., Joliet, Ill.
Midvale Steel Co., Philadelphia, Pa.
Morgan Engineering Co., Alliance, O.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Otis Steel Co., Cleveland, O.
Rockford Drop Forge Co., Rockford, Ill.
Steel Car Forge Co., Pittsburgh, Pa.
Vulcan Steel Products Co., New York, N. Y.
Williams, J. H., & Co., Brooklyn, N. Y.

FORMS (Concrete Construction).
Blaw-Knox Co., Pittsburgh, Pa.

FORMS (Special Wire).
American Steel & Wire Co., Chicago.

FOUNDRY EQUIPMENT AND SUPPLIES.
Arcade Mfg. Co., Freeport, Ill.
Blystone Mfg. Co., Cambridge Springs, Pa.
Hoevel Mfg. Corporation, New York City.
Lakewood Engrg. Co., Cleveland, O.
National Engineering Co., Chicago.
Oldham, Geo., & Sons Co., Frankford, Philadelphia, Pa.
Pangborn Corporation, Hagerstown, Md.
Pridmore, Henry E., Chicago, Ill.
Standard Sand & Machine Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

FOUNDRY GLOVES.
Hickory Steel Grip Glove Co., Chicago.

FOUNDRY PLANTS.
Arnold Co., The, Chicago, Ill.
Austin Co., The, Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

FRAMES (Wire Drawing).
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

FROGS (Railroad and Trolley).
Bethlehem Steel Co., The, So. Bethlehem, Pa.

FUEL OIL.
Clarendon Refining Co., Pittsburgh, Pa.
Texas Company, The, New York City.

FURNACE INSULATION.
Armstrong Cork & Insulation Co., Pittsburgh.
Botfield Specialties Co., Philadelphia.
Celite Products Co., New York, N. Y.

FURNACE SPECIALTIES.
Botfield Specialties Co., Philadelphia.
Quigley Furnace Specialties Co., New York.

FURNACES (Annealing and Case Hardening).
American Incandescent Heat Co., Boston.
General Electric Co., Schenectady, N. Y.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Hagan, Geo. J., Co., Pittsburgh, Pa.
Mahr Mfg. Co., Minneapolis, Minn.
Metals Production Equipment Co., New York.
Morgan Construction Co., Worcester, Mass.
Rockwell, W. S., Company, New York City.
Swindell, Wm., & Bros., Pittsburgh, Pa.
Whiting Fdy. Equipment Co., Harvey, Ill.

FURNACES (Blast).
Hagan, Geo. J., Co., Pittsburgh.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
McClure, G. W., Son & Co., Pittsburgh, Pa.
McKee, Arthur G., & Co., Cleveland, O.
Mt. Vernon Bridge Co., Mt. Vernon, O.
Pennsylvania Engrg. Works, New Castle, Pa.
Riter-Conley Mfg. Co., Pittsburgh, Pa.
Smythe, S. R., Co., Pittsburgh.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

FURNACES (Case Hardening and Heat Treating).
American Incandescent Heat Co., Boston.
Metals Production Equipment Co., New York.

FURNACES (Coal, Gas, Oil and Combination).
Gilbert & Barker Mfg. Co., Springfield, Mass.

FURNACES (Crucible).
Gilbert & Barker Mfg. Co., Springfield, Mass.
Laughlin, Alex., & Co., Pittsburgh, Pa.
Whiting Fdy. Equipment Co., Harvey, Ill.

FURNACES (Electric Steel).
Crowley, John A., Co., New York City.
Industrial Electric Furnace Co., Chicago.
Ludlum Electric Furnace Corp., New York.

FURNACES (Forging).
Gilbert & Barker Mfg. Co., Springfield, Mass.
Mahr Mfg. Co., Minneapolis, Minn.
Metals Production Equipment Co., New York.

FURNACES (Melting).
Industrial Electric Furnace Co., Chicago.
Ludlum Electric Furnace Corp., New York, N. Y.
Mahr Mfg. Co., Minneapolis, Minn.
McLain's System, Inc., Milwaukee, Wis.

FURNACES (Open Hearth).
Blair Engineering Co., Chicago, Ill.
Lindsay, W. W., Co., Inc., Philadelphia.
McLain's System, Inc., Milwaukee, Wis.
Smythe, S. R., Co., Pittsburgh, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.

FURNACES (Shrapnel).
Gilbert & Barker Mfg. Co., Springfield, Mass.
Metals Production Equipment Co., Springfield, Mass.

FURNACES (Water Cooled Specialties for Open Hearth).
Blaw-Knox Co., Pittsburgh, Pa.

FURNACES (Wire Annealing).
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

GALVANIZING.
Meaker Galvanizing Co., Chicago, Ill.

GALVANIZING EQUIPMENT.
American Bridge Co., New York.
Erie Foundry Co., Erie, Pa.
Meaker Galvanizing Co., Chicago, Ill.

GALVANIZING MATERIAL.
Meaker Galvanizing Co., Chicago, Ill.

GALVANIZED WIRE (Equipment).
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

GANISTER.
Kier Fire Brick Co., Pittsburgh, Pa.

GAS BOOSTERS (Rotary Positive Pressure).
Connersville Blower Co., The, Connersville, Ind.
Roots, P. H., & F. M., Co., Connersville, Ind.

GAS EXHAUSTERS.
Roots, P. H., & F. M., Co., Connersville, Ind.

GASKETS (Leather).
Graton & Knight Mfg. Co., The, Worcester, Mass.

GAS PRODUCERS.
Chapman Engineering Co., Mt. Vernon, O.
Hagan, Geo. J., Co., Pittsburgh, Pa.
Koppers, H., Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Smith Gas Engrg. Co., The, Lexington, O.
Wellman-Seaver-Morgan Co., Cleveland, O.

GAS RECOVERY COKE OVENS.
Koppers, H., Co., Pittsburgh, Pa.

GAUGES (Caliper).
Williams, J. H., & Co., Brooklyn, N. Y.

GEARS.
Plamondon, A., Mfg. Co., Chicago, Ill.

GEAR BLANKS (Bronze).
Aluminum Castings Co., Cleveland.

GEAR CASES.
National Malleable Castings Co., Cleveland, O.

GEAR CUTTING MACHINERY.
Newton Mach. Tool Wks., Inc., Philadelphia.
New York Machinery Exchange, Inc., New York, N. Y.
Simmons Machine Co., Inc., Albany, N. Y.

GEARS (Rawhide).
Chicago Rawhide Mfg. Co., Chicago, Ill.
Horsburgh & Scott Co., Cleveland, O.
New Process Gear Corp., Syracuse, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GEARS AND GEAR CUTTING.
National Roll & Foundry Co., Avonmore, Pa.
Sivyer Steel Castings Co., Milwaukee, Wis.

GEARS AND GEAR CUTTING (Iron and Steel).
American Steel Foundries, Chicago, Ill.
American Vanadium Co., The, Pittsburgh, Pa.
Farrell Foundry & Machine Co., Ansonia, Ct.
Fawcus Machine Co., Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
Horsburgh & Scott, Cleveland, O.
Hubbard Steel Fdy. Co., E. Chicago, Ind.
Lansing Foundry Co., The, Lansing, Mich.
Link-Belt Company, Chicago, Ill.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., The, Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
New Process Gear Corp., Syracuse, N. Y.
Newton Mch. Tool Works, Inc., Philadelphia.
Pittsburgh Iron & Steel Foundries, Pittsburgh, Pa.
Ross-Meehan Foundries, Chattanooga, Tenn.
Simonds Mfg. Co., Pittsburgh, Pa.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GEARS (Reverse, Marine).
Carlyle Johnson Mach. Co., Manchester, Conn.

GENERATORS.
Machinery Utilities Co., New York, N. Y.
Wickes Brothers, Saginaw, Mich.

GENERATORS (Direct and Alternating Current).
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GLOVES AND MITS (Asbestos).
Wheeler & Holcomb Co., Chicago.

GLOVES (Sand Blast).
Hickory Steel Grip Glove Co., Chicago.

GLOVES (Steel Grip).
Hickory Steel Grip Glove Co., Chicago.

GLOVES (Workmen's).
Hickory Steel Grip Glove Co., Chicago.

GOLD (Boronic Alloy in Shot Form).
American Boron Products Co., Inc., Reading, Pa.

GRAPHITE.
Dixon, Jos., Crucible Co., Jersey City, N. J.

GRATE BARS.
Botfield Specialties Co., Philadelphia, Pa.
Green Engrg. Co., E. Chicago, Ind.
Treadwell Engineering Co., Easton, Pa.

GREASES.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Texas Company, The, New York City.

GRINDERS (Electric).
Wonder Grinder Co., Erie, Pa.

GRINDERS (Inserted Tooth).
Hunter Saw & Machine Co., Pittsburgh.

GRINDING MACHINES.
Blake & Johnson Co., Waterbury, Conn.
Cincinnati Electric Tool Co., Cincinnati, O.
Cleveland Pneumatic Tool Co., Cleveland, O.
Gardner Machine Co., Beloit, Wis.
Modern Tool Co., Erie, Pa.
Newton Mch. Tool Works, Inc., Philadelphia.
New York Machinery Exchange, Inc., New York, N. Y.
Ransom Mfg. Co., Oshkosh, Wis.
Simmons Machine Co., Inc., Albany, N. Y.
Toomey, Frank, Inc., Philadelphia, Pa.

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GRINDING PANS.
American Clay Machinery Co., Bucyrus, O.
National Engineering Co., Chicago.
Phillips & McLaren Co., Pittsburgh, Pa.
Stevenson Co., The, Wellsville, O.

GRINDING AND POLISHING MACHINERY, SUPPLIES AND ACCESSORIES.
Gardner Machine Co., Beloit, Wis.

GUARDS (Machinery).
Erdle Perforating Co., Rochester, N. Y.

GUIDES (For Wire, Rod and Billet Mills).
Pittsburgh Iron & Steel Foundries Co., Pittsburgh, Pa.

HAMMERS.
New York Machinery Exchange, Inc., New York, N. Y.

HAMMERS (Drop).
Alliance Machine Co., Alliance, O.
Beaudry & Co., Inc., Boston, Mass.
Bliss, E. W., Co., Brooklyn, N. Y.
Buffalo Fdy. & Machine Co., Buffalo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York, N. Y.
Simmons Machine Co., Inc., Albany, N. Y.
Toledo Machine & Tool Co., Toledo, O.
Toomey, Frank, Inc., Philadelphia, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
United Hammer Co., Boston, Mass.

HAMMERS (Link Welding).
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

HAMMERS (Power).
Beaudry & Co., Inc., Boston, Mass.
Bradley, C. C., & Son, Inc., Syracuse, N. Y.
Buffalo Foundry & Machine Co., Buffalo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cleveland Pneumatic Tool Co., Cleveland, O.
Cleveland Punch & Shear Works Co., Cleveland, O.
Erie Foundry Co., Erie, Pa.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York, N. Y.
Simmons Machine Co., Inc., Albany, N. Y.
Toledo Machine & Tool Co., Toledo, O.
United Hammer Co., Boston, Mass.

HAMMERS (Rawhide).
Chicago Rawhide Mfg. Co., Chicago, Ill.

HAMMERS (Shell Nosing).
Beaudry & Co., Inc., Boston, Mass.
United Hammer Co., Boston, Mass.

HANDLES (Machine).
Williams, J. H., & Co., Brooklyn, N. Y.

HAND PADS (Steel Grip).
Hickory Steel Grip Glove Co., Chicago.

HARDWARE (Wagon).
Oliver Iron & Steel Co., Pittsburgh, Pa.

HEAT INSULATING (Brick and Powder).
Celite Products Co., New York, N. Y.

HEAT TREATING.
Bidle, W. S. Co., Cleveland, O.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Steel Improvement & Forge Co., Cleveland, O.
Williams, J. H., & Co., Brooklyn, N. Y.

HOISTING MACHINERY.
Alliance Machine Co., Alliance, O.
Case Crane & Engineering Co., Columbus, O.
Chesapeake Iron Works, Baltimore, Md.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Dake Engine Co., Grand Haven, Mich.
Euclid Crane & Hoist Co., Euclid, O.
Hendrick Mfg. Co., Carbondale, Pa.
Illinois Malleable Iron Co., Chicago, Ill.
Link-Belt Company, Chicago, Ill.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York City.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Ridgway, Craig & Son, Coatesville, Pa.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Toledo Bridge & Crane Co., Toledo, O.
Wellman-Seaver-Morgan Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.
Williams, G. H., Co., Erie, Pa.
Yale & Towne Mfg. Co., New York City.

HOISTS (Chain).
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Yale & Towne Mfg. Co., New York, N. Y.

HOISTS (Electric).
Euclid Crane & Hoist Co., Euclid, O.
Northern Engineering Works, Detroit, Mich.
Pawling & Harnischfeger Co., Milwaukee, Wis.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.

HOISTS (Electric, Portable).
Yale & Towne Mfg. Co., New York, N. Y.

HOISTS (Pneumatic).
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.

HOOKS (Hoist).
Williams, J. H., & Co., Brooklyn, N. Y.

HOOPS AND BANDS.
Bourne-Fuller Co., The, Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
Latshaw Steel & Metal Products Corp., New York, N. Y.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
West Leechburg Steel Co., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

HOOPS (Wire).
American Steel & Wire Co., Chicago, Ill.

HORSE SHOES AND CALKS.
American Steel & Wire Co., Chicago, Ill.

HOSE (Pneumatic).
Cleveland Pneumatic Tool Co., Cleveland, O.
Oldham, Geo., & Sons Co., Frankford, Philadelphia, Pa.

HOT BEDS.
Treadwell Engineering Co., Easton, Pa.

HYDRAULIC MACHINERY.
Lourie Mfg. Co., Springfield, Ill.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Southwark Fdy. & Mch. Co., Philadelphia, Pa.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

HYDRAULIC PRESSES.
New York Machinery Exchange, Inc., New York, N. Y.

HYDROGEN.
International Oxygen Co., New York, N. Y.

IMPORT AND EXPORT AGENTS.
Grandfield, W. J., & Co., Philadelphia, Pa.

INDUSTRIAL PLANTS.
Arnold Co., The, Chicago, Ill.
Austin Co., The, Cleveland, O.

INGOT AND OPEN HEARTH CHARGING CARS.
Pennsylvania Engrg. Works, New Castle, Pa.
Treadwell Engineering Co., Easton, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.

INGOT CARS.
Lakewood Engrg. Co., Cleveland, O.

INGOT MOLDS.
Marshall Foundry Co., Pittsburgh, Pa.
Penn Mold & Mfg. Co., Wheeling, W. Va.
Pittsburgh Iron & Steel Foundries Co., Pittsburgh, Pa.

INGOT (Electric Furnace Steel).
Latrobe Electric Steel Co., Latrobe, Pa.

INSERTS (Steel).
Trussed Concrete Steel Co., Detroit, Mich.

INSPECTORS (Heat Treated Metal).
Pennsylvania Inspection Bureau, Johnstown, Pa.

INSTRUMENTS (Electric Indicating and Recording).
General Electric Co., Schenectady, N. Y.
Smith Gas Engrg. Co., The, Lexington, O.

INSULATING BRICK.
Armstrong Cork & Insulation Co., Pittsburgh.
Botfield Specialties Co., Philadelphia.
Celite Products Co., New York, N. Y.
Wagner Fire Brick Co., Scranton, Pa.

INSULATION (Furnaces, Boiler Settings, Ovens, Steam Pipe, Etc.).
Armstrong Cork & Insulation Co., Pittsburgh.
Celite Products Co., New York, N. Y.

IRON.
American Vanadium Co., The, Pittsburgh, Pa.
Andrews Steel Co., Newport, Ky.
Beals, McCarthy & Rogers, Buffalo, N. Y.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., The, Cleveland, O.
Brown-Wales Co., Boston, Mass.
Lockhart Iron & Steel Co., McKees Rocks, Pa.
McCalla, Harold, Philadelphia, Pa.
Monongahela Iron & Steel Co., Pittsburgh, Pa.
Newport Rolling Mill Co., Newport, Ky.
Pittsburgh Tool Steel Wire Co., Monaca, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Vulcan Iron & Steel Co., Pittsburgh, Pa.
Westerman & Co., Lockport, N. Y.
Whitaker-Glessner Co., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

IRON (Bar).
Lockhart Iron & Steel Co., McKees Rocks, Pa.
Monongahela Iron & Steel Co., Pittsburgh, Pa.
St. Louis Screw Co., St. Louis, Mo.
Vulcan Iron & Steel Co., Pittsburgh, Pa.

IRON (Ornamental).
Belmont Iron Works, Philadelphia, Pa.

IRON (Silvery).
Globe Iron Co., Jackson, O.

IRON AND TIMBER LANDS.
Neely, Benjamin C., Crystal Falls, Mich.

IRON ORE.
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, Eng.
Breitung, E. N., & Co., Cleveland, O.
Cuyuna Minneapolis Iron Co., Minneapolis, Minn.
Hanna, M. A., & Co., Cleveland, O.
Hillman, J. H., & Sons Co., Pittsburgh, Pa.
Oglebay, Norton & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.
Snyder, W. P., & Co., Pittsburgh, Pa.
Tod-Stambaugh Co., Cleveland, O.
Wharton Steel Co., New York City.

JIGS AND FIXTURES.
Co-operative Engineering Co., Inc., New York.

JOISTS AND STUDS (Pressed Steel).
Trussed Concrete Steel Co., Detroit, Mich.

JOLT RAMMING MACHINES.
Pridmore, Henry E., Chicago, Ill.

KEYS AND COTTERS (Machine).
Moltrup Steel Products Co., Beaver Falls, Pa.
Morton Mfg. Co., Muskegon Heights, Mich.
Standard Gauge Steel Co., Beaver Falls, Pa.
Williams, J. H., & Co., Brooklyn, N. Y.

KEYSEATERS.
Baker Bros., Toledo, O.
New York Machinery Exchange, Inc., New York, N. Y.
Simmons Machine Co., Inc., Albany, N. Y.

KNIVES (Circular).
Hunter Saw & Machine Co., Pittsburgh.

LABORATORIES.
Hunt, Robert W., & Co., Chicago, Ill.

LACQUERS (Anti-Rust).
Pittsburgh Insulating Co., Pittsburgh.

LADLES.
Mitchell-Tappen Co., New York, N. Y.
Pennsylvania Engrg. Works, New Castle, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

LADLE BRICK.
Pope, Frank B., Pittsburgh, Pa.

LAMPS (Arc and Incandescent).
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

LATH (Expanded Metal).
Trussed Concrete Steel Co., Detroit, Mich.

LATHES.
Acme Machine Tool Co., Cincinnati, O.
Bullard Machine Tool Co., Bridgeport, Conn.
Cincinnati Iron & Steel Co., Cincinnati, O.
Greaves-Klusman Co., Cincinnati, O.
Jones & Lamson Mach. Co., Springfield, Vt.
Manning, Maxwell & Moore, Inc., New York, N. Y.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
New Britain Mach. Co., New Britain, Conn.
Niles-Bement-Pond Co., New York, N. Y.
Simmons Machine Co., Inc., Albany, N. Y.
Simplex Mach. Tool Co., The, Hamilton, O.
Toomey, Frank, Inc., Philadelphia, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Warner & Swasey Co., Cleveland, O.
Wickes Brothers, Saginaw, Mich.
Youngstown Fdy. & Mch. Co., Youngstown, O.

LATHES (Chucking, Vertical).
Bullard Machine Tool Co., Bridgeport, Conn.
Simmons Machine Co., Inc., Albany, N. Y.

LATHES (Vertical Turret).
Bullard Machine Tool Co., Bridgeport, Conn.
New York Machinery Exchange, Inc., New York, N. Y.
Simmons Machine Co., Inc., Albany, N. Y.

LATHE DOGS (Safety).
Williams, J. H., & Co., Brooklyn, N. Y.

LEAD.
United Smelting & Aluminum Co., New Haven, Conn.

LEATHER (Hydraulic).
Graton & Knight Mfg. Co., Worcester, Mass.

LEATHER BELTING (See Belting, Leather).

LEATHER (Belt Lace)
Graton & Knight Co., Worcester, Mass.

LEG AND FOOT PROTECTORS.
Wheeler & Holcomb Co., Chicago.

LETTERS AND FIGURES (Steel, Hand Made).
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Moss, Henry, & Co., New York, N. Y.

LETTERHEADS (Engraved).
Wiggins, John B., Co., Chicago, Ill.

LIFTING MAGNETS.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.

LIMESTONE.
Davison, Allen S., Co., Pittsburgh, Pa.

LININGS (Cupola, Furnace and Forge).
Botfield Specialties Co., Philadelphia.
Brighton Fire Brick Co., New Brighton, Pa.
Harbison-Walker Refractories Co., Pittsburgh.
Louisville Fire Brick Wks., Highland Park, Ky.
Mutton Hollow Fire Brick Co., Woodbridge, N. J.
Wagner Fire Brick Co., Scranton, Pa.

LINK BELTING.
Link-Belt Company, Chicago, Ill.

LOCKERS (Metal).
Edwards Mfg. Co., The, Cincinnati, O.

LOCOMOTIVES.
General Electric Co., Schenectady, N. Y.
Vulcan Iron Works, Wilkes-Barre, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

LOCOMOTIVES (Electric).
Atlas Car & Mfg. Co., Cleveland, O.
Baldwin Locomotive Works, Philadelphia, Pa.

LOCOMOTIVES (Second Hand).
Zelnicker, Walter A., Supply Co., St. Louis.

LOCOMOTIVE CRANES (Second Hand).
Luther, Frederick P., Co., Chicago.
Torbert, A. C., Chicago, Ill.

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CASTINGS

PITTSBURGH MALLEABLE IRON CO.
MALLEABLE CASTINGS
Pittsburgh, Penna.

ZANESVILLE MALLEABLE CO.
MALLEABLE CASTINGS
ZANESVILLE, OHIO

TISCO MANGANESE STEEL CASTINGS
FOR SEVERE SERVICE
Taylor-Wharton Iron & Steel Co.
High Bridge, New Jersey

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AUTOMOBILE CASTINGS A SPECIALTY
Service
DAYTON, OHIO.

HAMMOND
Malleable Iron Co.
Capacity 20,000 tons per annum
Hammond, Indiana

LUBRICANTS.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Texas Company, The, New York City.

LUMBER (Boxing, Crating, Flask, Pattern and Templet).
Johnson Lumber Co., Milwaukee, Wis.

LUMBER (Creosoted).
Ayer & Lord Tie Co., Chicago.

MACHINE COUNTERS.
Hart, R. A., Mfg. Co., Battle Creek, Mich.

MACHINE KEYS (See Keys and Cotters, Machine).

MACHINERY.
Vulcan Steel Products Co., New York, N. Y.

MACHINERY (Second Hand). (See Second Hand Machinery).

MACHINERY (Special).
Lammert & Mann Co., Chicago, Ill.
Plamondon, A., Mfg. Co., Chicago, Ill.
Treadwell Engineering Co., Easton, Pa.
Way, A. F., Co., Inc., Hartford, Conn.
Wheeling Mold & Foundry Co., Wheeling, W. Va.

MACHINISTS.
Adamson Machine Co., Akron, O.
Air Tight Steel Tank Co., Pittsburgh, Pa.
Blake & Johnson Co., Waterbury, Conn.
Bliss, E. W., Brooklyn, N. Y.
Brown Clutch Co., Sandusky, O.
Buffalo Fdy. & Mach. Co., Buffalo, N. Y.
Case Crane & Engrg. Co., The, Columbus, O.
Co-operative Engineering Co., Inc., New York.
Diamond Machine Co., Monongahela, Pa.
Erie Foundry Co., Erie, Pa.
Fawcus Machine Co., Pittsburgh, Pa.
Hill Pump Valve Co., Chicago, Ill.
Klotz Machine Co., Sandusky, O.
Link-Belt Company, Chicago, Ill.
Manning, Maxwell & Moore, Inc., New York, N. Y.
Mesta Machine Co., Pittsburgh, Pa.
Metal Machining Co., The, Cleveland, O.
Metal Machining Tool Co., Cleveland, O.
Modern Machine Co., Bellefontaine, O.
Morgan Engrg. Co., Alliance, O.
Newbold, R. S., Son & Co., Norristown, Pa.
Overholt Machine Co., Seville, O.
Toledo Mach. & Tool Co., Toledo, O.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.

MAGNESITE.
American Refractories Co., Chicago, Ill.
Davison, Allen S., Co., Pittsburgh, Pa.
Mineral Supply Co., Chicago, Ill.

MAGNESITE (Calcined, Crude, Dead Burned).
Davison, Allen S., Co., Pittsburgh, Pa.
Harbison-Walker Refractories Co., Pittsburgh, Pa.

MAGNETIC SEPARATORS.
Cutler-Hammer, The, Mfg. Co., Milwaukee.

MASON CONTRACTORS (Blast Furnace Work).
Rinehart, J. W., Cleveland, O.

MERCHANT BARS.
Vulcan Steel Products Co., New York, N. Y.

MERCHANT MILL EQUIPMENT.
Treadwell Engineering Co., Easton, Pa.

METAL (Acid Proof).
Keystone Bronze Co., Pittsburgh, Pa.

METAL CLEANER.
Ford, J. B., Co., Wyandotte, Mich.

METAL CUTTING MACHINES.
Peerless Machine Co., Racine, Wis.
Racine Tool & Machine Co., Racine, Wis.

METAL CUTTING TOOLS (Stellite).
Haynes Stellite Co., The, Kokomo, Ind.

METAL SPECIALTIES AND PARTS.
Erdle Perforating Co., Rochester, N. Y.
White, L. & I. J., Co., Buffalo, N. Y.

METALS (Bearing).
Aluminum Castings Co., Cleveland.

METALLURGY OF IRON.
McLain's System, Inc., Milwaukee, Wis.

METALLURGISTS.
Cleveland Metal Treating & Welding Co., Cleveland, O.
Haynes Stellite Co., The, Kokomo, Ind.
Hunt, Robert W., & Co., Chicago, Ill.
Steel Improvement & Forge Co., Cleveland, O.

METAL (Notch, Bar and Ingot).
Pittsburgh Aluminum Co., Pittsburgh, Pa.

METAL (Perforated).
Erdle Perforating Co., Rochester, N. Y.

METALS (Non-Ferrous).
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, England.
Lubricating Metal Co., The, New York City.
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

MILL AND MINE SUPPLES.
Lunkenheimer Co., The, Cincinnati, O.

MILL WEARING PARTS.
Midvale Steel Co., The, Philadelphia, Pa.

MILL CUTTERS.
Cleveland Milling Machine Co., Cleveland, O.

MILLING MACHINES.
Cincinnati Milling Mach. Co., Cincinnati, O.
Cleveland Milling Machine Co., Cleveland, O.
Espen-Lucas Machine Works, Philadelphia, Pa.
Kempsmith Mfg. Co., Milwaukee, Wis.
Newton Mach. Tool Wks., Inc., Philadelphia.
New York Machinery Exchange, Inc., New York, N. Y.
Niles-Bement-Pond Co., New York, N. Y.
Simmons Machine Co., Inc., Albany, N. Y.
Toomey, Frank, Inc., Philadelphia, Pa.

MILLS (Blooming, Universal, Plate, Sheet, Tin, Bar).
Mesta Machine Co., Pittsburgh, Pa.
Treadwell Engineering Co., Easton, Pa.

MILLS (Boring and Turning, Vertical).
Bullard Machine Tool Co., Bridgeport, Conn.

MINING MACHINERY.
Link-Belt Company, Chicago, Ill.
McMyler Interstate Co., Cleveland, O.
Wellman-Seaver-Morgan Co., Cleveland, O.

MINING OPTIONS AND LEASES.
Neely, Benjamin C., Crystal Falls, Mich.

MITTENS (Steel Grip).
Hickory Steel-Grip Glove Co., Chicago.

MIXERS (Concrete).
Blaw-Knox Co., Pittsburgh, Pa.
Blystone Mfg. Co., Cambridge Springs, Pa.
Standard Scale & Supply Co., Pittsburgh, Pa.

MIXERS (Daubing).
National Engineering Co., Chicago.

MIXERS (Foundry Facings).
Blystone Mfg. Co., Cambridge Springs, Pa.
National Engineering Co., Chicago, Ill.

MIXERS (Hot Metal).
Pennsylvania Engineering Works, New Castle, Pa.
Treadwell Engineering Co., Easton, Pa.

MIXERS (Sand).
Blystone Mfg. Co., Cambridge Springs, Pa.
Dunning, W. D., Syracuse, N. Y.
National Engineering Co., Chicago.

MOLDS (Concrete).
Blaw-Knox Co., Pittsburgh, Pa.

MOLDS (Ingot).
Penn Mold & Mfg. Co., Wheeling, W. Va.

MOLDING MACHINES.
Arcade Mfg. Co., Freeport, Ill.
Pridmore, Henry E., Chicago, Ill.

MOLDING (Automobile).
Empire Art Metal Co., College Pt., N. Y.

MONEL METAL.
Williams & Co., Pittsburgh, Pa.

MOTOR (Air).
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MOTORS.
Machinery Utilities Co., New York.
Wickes Brothers, Saginaw, Mich.

MOTORS (Electric).
Benjamin, Morris, New York.
Crocker-Wheeler Co., Ampere, N. J.
General Electric Co., Schenectady, N. Y.
Toomey, Frank, Inc., Philadelphia, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MOTORS (Second Hand).
Benjamin, Morris, New York.
Klein, Nathan, & Co., Inc., New York City.
Miller-Owen Electric Co., Pittsburgh, Pa.
Steam & Electrical Machinery Co., Bay City, Mich.

MOTOR TRUCKS.
Federal Motor Truck Co., Detroit, Mich.

MUFFLERS (Wire Mill Equipment).
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

NAIL MACHINERY (Wire).
Sleeper & Hartley, Inc., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

NAIL MACHINERY.
Kilby Mfg. Co., Cleveland, O.
National Machinery Co., Tiffin, O.
Sleeper & Hartley, Inc., Worcester, Mass.

NAILS.
American Steel & Wire Co., Chicago, Ill.
Cambria Steel Co., Philadelphia, Pa.
Interstate Iron & Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
La Belle Iron Works, Steubenville, O.
Youngstown Sh't & Tube Co., Youngstown, O.

NAILS (Copper).
American Steel & Wire Co., Chicago, Ill.

NAILS, WIRE (Coated).
Continental Steel & Supply Co., Pittsburgh.
Vulcan Steel Products Co., New York, N. Y.

NAME PLATES (Cast Bronze, Stamped and Etched).
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Moss, Henry, & Co., New York, N. Y.
Pannier Bros. Stamp Co., Pittsburgh, Pa.

NICKEL (Boronic Alloy in Shot Form).
American Boron Products Co., Inc., Reading, Pa.

NUTS (See Bolts and Nuts).

NUTS (Hot Pressed).
Bourne-Fuller Co., Cleveland, O.
St. Louis Screw Co., St. Louis, Mo.
Upson Nut Company, Cleveland, O.

NUTS (Semi-Finished).
St. Louis Screw Co., St. Louis, Mo.
Upson Nut Company, Cleveland, O.

OIL.
Clarendon Refining Co., Pittsburgh, Pa.
Texas Co., The, New York, N. Y.

OIL CANS.
New Britain Machine Co., New Britain, Conn.

OPEN HEARTH FURNACES (See Furnaces —Open-Hearth).

ORDNANCE.
Midvale Steel Co., Philadelphia, Pa.

ORE (Chrome).
Blackwell, Geo. G., Sons & Co., Ltd., Liverpool, England.

ORE DOCKS.
American Bridge Co., New York, N. Y.

ORE GRINDING MACHINERY.
Bonnot Co., The, Canton, O.

ORE HANDLING MACHINERY.
Blaw-Knox Co., Pittsburgh, Pa.
Brown Hoisting Machinery Co., Cleveland, O.
Hayward Company, The, New York City.
Wellman-Seaver-Morgan Co., Cleveland, O.

OVENS (Coke, By-Product Recovery).
Koppers, H., Co., Pittsburgh, Pa.

OXY-ACETYLENE WELDING AND CUTTING.
Co-operative Engineering Co., Inc., New York
Linde Air Products Co., New York, N. Y.
Oxweld Acetylene Co., Chicago, Ill.
Prest-O-Lite Co., The, Indianapolis, Ind.

OXYGEN.
International Oxygen Co., New York, N. Y.
Linde Air Products Co., New York, N. Y.
Oxweld Acetylene Co., Chicago, Ill.

PACKING (Metallic).
Lubricating Metal Co., The, New York, N. Y.

PACKING (Leather).
Graton & Knight Mfg. Co., Worcester, Mass.

PAINT (Silica-Graphite).
Dixon, Jos., Crucible Co., Jersey City, N. J.

PANS (Grinding).
American Clay Machinery Co., Bucyrus, O.

PANS (Lathe and Shop).
American Bridge Co., New York, N. Y.
New Britain Mach. Co., New Britain, Conn.

PATTERN PLATES (Steel).
Moltrup Steel Products Co., Beaver Falls, Pa.

PATTERNS (Wood and Metal).
Acme Steel & Mall. Iron Wks., Inc., Buffalo.
Aluminum Castings Co., Cleveland.
Arcade Mfg. Co., Freeport, Ill.
Barnum, S. H., New Haven, Conn.
Bayley, The Wm., Co., Springfield, O.
Buffalo Fdy. & Mch. Co., Buffalo, N. Y.
Co-operative Engineering Co., Inc., New York.
Corbett-Steeves Pattern Wks., Rochester, N. Y.
Diamond Machine Co., Monongahela, Pa.
Empire Art Metal Co., College Pt., N. Y.
Freeman Pattern Supply Co., Toledo, O.
Hammond Malleable Iron Co., Hammond, Ind.
Leetsdale Foundry & Mfg. Co., Leetsdale, Pa.
Marion Malleable Iron Works, Marion, Ind.
Pridmore, Henry E., Chicago, Ill.
Standard Pattern Works, Canton, Ohio.
Stenzel Pattern Works, Houston, Tex.
Wellman Pattern Supply Co., Cleveland, O.

PERFORATED METAL.
Erdle Perforating Co., Rochester, N. Y.
Hendrick Mfg. Co., Carbondale, Pa.

PHOSPHOR BRONZE.
Aluminum Castings Co., Cleveland.

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Dayton Malleable Iron Co.
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CASTINGS
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PIERCING POINTS, PLUGS AND BALLS (For Tube Mills).

Pittsburgh Iron & Steel Foundries Co., Pittsburgh, Pa.

PIG IRON.

Addy, The Matthew, Co., Cincinnati, O.
Baird & West, Detroit, Mich.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., The, Cleveland, O.
Crocker Bros., New York, N. Y.
Davison Allen S., Co., Pittsburgh, Pa.
Delaware River Steel Co., Chester, Pa.
Easton, Rhodes & Co., Cincinnati, O.
Fobewood Coal & Iron Co., Pittsburgh, Pa.
Globe Iron Co., Jackson, O.
Hanna, M. A., & Co., Cleveland, O.
Illinois Steel Co., Chicago, Ill.
McKeefrey & Co., Leetonia, O.
Mitchell-Diggins Iron Co., Cadillac, Mich.
Mohr, J. J., & Son, Philadelphia, Pa.
Mudge, Edmund W., & Co., Pittsburgh, Pa.
Pickands, Mather & Co., Cleveland, O.
Republic Iron & Steel Co., Youngstown, O.
Rogers, Brown & Co., Cincinnati, O.
Snyder, W. P., & Co., Pittsburgh, Pa.
Stewart Iron Co., Ltd., Cleveland, O.
Struthers Furnace Co., The, Cleveland, O.
Superior Charcoal Iron Co., Grand Rapids, Mich.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Thomas Furnace Co., Milwaukee, Wis.
Upson Nut Co., Cleveland, O.
Wharton Steel Co., New York City.
Wickwire Steel Co., Buffalo, N. Y.

PIG IRON BREAKERS.

Brown Hoisting Machinery Co., Cleveland, O.

PILE DRIVERS.

Industrial Works, Bay City, Mich.

PILING (Creosoted).

Ayer & Lord Tie Co., Chicago.

PILING (Steel Sheet).

Carnegie Steel Co., Pittsburgh, Pa.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.

PINIONS (Gears and Gear Cutting).

PINS.

American Vanadium Co., The, Pittsburgh, Pa.
Oliver Iron & Steel Co., Pittsburgh, Pa.

PIPE (Cast Iron).

American Cast Iron Pipe Co., Birmingham, Ala.
Clow, James B., & Sons, Chicago, Ill.
Donaldson Iron Co., Emaus, Lehigh Co., Pa.
Glamorgan Pipe & Fdy. Co., Lynchburg, Va.
Lynchburg Fdy. Co., Lynchburg, Va.
Massillon Iron & Steel Co., Massillon, O.
U. S. Cast Iron Pipe & Fdy. Co., Burlington, N. J.
Warren Foundry & Machine Co., New York.

PIPE (Culvert).

Newport Rolling Mill Co., Newport, Ky.

PIPE (Iron and Steel).

American Bridge Co., New York, N. Y.
American Steel Export Co., New York City.
Bourne-Fuller Co., The, Cleveland, O.
Buffalo Fdy. & Mch. Co., Buffalo, N. Y.
Byers, A. M., Co., Pittsburgh, Pa.
Central Tube Co., Pittsburgh, Pa.
La Belle Iron Works, Steubenville, O.
Mark Mfg. Company, Evanston, Ill.
Pittsburgh Piping & Equip. Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburgh, Pa.
U. S. Cast Iron Pipe & Fdy. Co., Burlington, N. J.
Vulcan Steel Products Co., New York, N. Y.
Youngstown Sh't & Tube Co., Youngstown, O.

PIPE (Steel).

National Tube Co., Pittsburgh, Pa.
Wheeling Steel & Iron Co., Wheeling, W. Va.
Youngstown Sh't & Tube Co., Youngstown, O.

PIPE (Wrought Iron.)

Bourne-Fuller Co., The, Cleveland, O.
Byers, A. M., Co., Pittsburgh, Pa.
Pittsburgh Piping & Equip. Co., Pittsburgh.
Youngstown Sh't & Tube Co., Youngstown, O.

PIPE BENDS.

Roessing-Ernst Co., Etna, Pittsburgh, Pa.

PIPE COVERING (Steam and Cold Water.)

Armstrong Cork & Insulation Co., Pittsburgh.

PIPE FITTINGS.

Illinois Malleable Iron Co., Chicago, Ill.
Lunkenheimer Co., The, Cincinnati, O.
Pittsburgh Piping & Equip. Co., Pittsburgh.
Southwark Fdy. & Mach. Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

PIPE MACHINES.

New York Machinery Exchange, Inc., New York, N. Y.

PIPE MILL MACHINERY.

Landis Machine Co., Waynesboro, Pa.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

PIPE MOLDS (Concrete).

Blaw-Knox Co., Pittsburgh, Pa.

PIPE TAGS.

Matthews, Jas. H., & Co., Pittsburgh, Pa.
Moss, Henry, & Co., New York, N. Y.

PIPE THREADING MACHINERY.

Standard Engrg. Co., Elwood City, Pa.
Toomey, Frank, Inc., Philadelphia, Pa.
Treadwell Enginering Co., Easton, Pa.

PIPING CONTRACTORS.

Pittsburgh Piping & Equip. Co., Pittsburgh.

PISTONS.

Aluminum Castings Co., Cleveland.

PISTON RODS.

Bay City Forge Co., Erie, Pa.
Heppenstall Forge & Knife Co., Pittsburgh.

PLANERS.

Cincinnati Planer Co., Cincinnati, O.
Cleveland Punch & Shear Works Co., Cleveland, O.
Manning, Maxwell & Moore, Inc., New York, N. Y.
Morton Mfg. Co., Muskegon Heights, Mich.
Newton Mch. Tool Works, Inc., Philadelphia.
New York Machinery Exchange, Inc., New York, N. Y.
Niles-Bement-Pond Co., New York, N. Y.
Simmons Machine Co., Inc., Albany, N. Y.
Toomey, Frank, Inc., Philadelphia, Pa.

PLATES (Rolled Steel—Floor).

Carnegie Steel Co., Pittsburgh, Pa.
Wood, Alan, Iron & Steel Co., Philadelphia.

PLATES (Sheared and Universal).

Allegheny Steel Co., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
Belmont Iron Works, Philadelphia, Pa.
Bourne-Fuller Co., The, Cleveland, O.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Nagle Steel Co., Pottstown, Pa.
Otis Steel Co., Cleveland, O.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Jos. T., & Son, Chicago, Ill.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Whitaker-Glessner Co., Wheeling, W. Va.
Wood, Alan, Iron & Steel Co., Philadelphia.
Worth Bros. Co., Philadelphia, Pa.
Youngstown Sh't & Tube Co., Youngstown, O.

PLATES (Terne and Tin).

American Sheet & Tin Plate Co., Pittsburgh.

PLATES (Vanadium Steel).

American Vanadium Co., The, Pittsburgh, Pa.

PLUNGERS (For Pumps.)

Pittsburgh Iron & Steel Foundries Co., Pittsburgh, Pa.

POINTERS (Wire and Rod).

Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

POLE LINE HARDWARE (Plain and Galvanized).

Michigan Bolt & Nut Works, Detroit, Mich.

POLISHING MACHINERY.

Gardner Machine Co., Beloit, Wis.

POSTS (Steel Fence).

American Steel & Wire Co., Chicago, Ill.

POULTRY NETTING.

American Steel & Wire Co., Chicago, Ill.

POWDERED COAL EQUIPMENT.

Bonnot Co., The, Canton, O.
Lehigh Car, Wheel & Axle Works, Catasauqua, Pa.
Metals Production Equipment Co., New York.
Quigley Furnace Specialties Co., New York.
Raymond Bros. Impact Pulverizer Co., The., Chicago, Ill.

POWER PLANTS.

Arnold Co., The, Chicago, Ill.
Austin Co., The, Cleveland, O.

POWER TOOLS.

Southwark Foundry & Mach. Co., Philadelphia.

POWER TRANSMITTING MACHINERY.

Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Link-Belt Co., Chicago, Ill.
Mesta Machine Co., Pittsburgh, Pa.
Plamondon, A., Mfg. Co., Chicago, Ill.
Treadwell Engineering Co., Easton, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

PRECISION WORK.

Co-operative Engineering Co., New York.

PRESSED METAL.

Empire Art Metal Co., Inc., College Pt., N. Y.

PRESSES.

Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Bliss, E. W., Co., Brooklyn, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cleveland Punch & Shear Works Co., Cleveland, O.
Erie Foundry Co., Erie, Pa.
General Briquetting Co., New York City.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
New York Machinery Exchange, Inc., New York, N. Y.
Niles-Bement-Pond Co., New York, N. Y.
Southwark Fdy. & Mch. Co., Philadelphia, Pa.
Toledo Machine & Tool Co., Toledo, O.
Toomey, Frank, Inc., Philadelphia, Pa.
Teadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wood, R. D., & Co., Philadelphia, Pa.

PRESSURE GAGES.

Clark, Chas. J., Chicago, Ill.

PRESSURE REGULATORS.

Connersville Blower Co., The, Connersville, Ind.
Electric Controller & Mfg. Co., Cleveland, O.

PROJECTILES.

Midvale Steel Co., Philadelphia, Pa.

PULVERIZING MILLS.

Bonnot Co., The, Canton, O.
Lehigh Car, Wheel & Axle Works, Catasauqua, Pa.
Raymond Bros. Impact Pulverizer Co., The, Chicago, Ill.

PUMPS.

Buffalo Fdy. & Machine Co., Buffalo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Connersville Blower Co., The, Connersville, Ind.
Dean Bros. Steam Pump Works, Indianapolis, Ind.
Deming Co., Salem, O.
Mesta Machine Co., Pittsburgh, Pa.
Roots, P. H., & F. M., Co., Connersville, Ind.
Standard Scale & Supply Co., Pittsburgh, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

PUNCHES AND SHEARS.

New York Machinery Exchange, Inc., New York, N. Y.

PUNCHING AND SHEARING MACHINERY.

Allen, John F., Co., New York, N. Y.
Alliance Machine Co., Alliance, O.
Bliss, E. W., Co., Brooklyn, N. Y.
Bourne-Fuller Co., The, Cleveland, O.
Cleveland Punch & Shear Works Co., Cleveland, O.
Erie Foundry Co., Erie, Pa.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
Niles-Bement-Pond Co., New York, N. Y.
Richards, I. P., Providence, R. I.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Simmons Machine Co., Inc., Albany, N. Y.
Thomas Spacing Machine Co., Pittsburgh, Pa.
Toomey, Frank, Inc., Philadelphia, Pa.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wickes Brothers, Saginaw, Mich.
Wood, R. D., & Co., Philadelphia, Pa.

PURIFIERS (All Metals Boronic in Shot Form).

American Boron Products Co., Inc., Reading, Pa.

PUSH BUTTONS.

Electric Controller & Mfg. Co., Cleveland, O.

RACKS (Steel or Tool).

Empire Art Metal Co., Inc., College Pt., N. Y.
New Britain Mach. Co., New Britain, Conn.

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RAIL JOINTS.
Carnegie Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.

RAILROAD EQUIPMENT (Industrial).
Lakewood Engrg Co., Cleveland, O.

RAILROAD SUPPLIES.
American Steel Export Co., New York City.
Luther, Frederick P., Co., Chicago.
Vulcan Steel Products Co., New York.
Zelnicker, Walter A., Supply Co., St. Louis, Mo.

RAILS.
American Steel Export Co., New York City.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Cambria Steel Co., Johnstown, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Green, L. A., Pittsburgh.
Illinois Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.
Tenn. Coal, Iron & R. R. Co., Birmingham, Ala.
Vulcan Steel Products Co., New York, N. Y.

RAILS (Girder).
Bethlehem Steel Co., The, So. Bethlehem, Pa.

RAILS (High Tee).
Bethlehem Steel Co., The, So. Bethlehem, Pa.

REAMERS.
Clark Equipment Co., Buchanan, Mich.

REAMERS (Bridge).
Latrobe Tool Co., The, Latrobe, Pa.

REELS (Wire Mill Equipment).
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

REINFORCEMENT (Steel).
Trussed Concrete Steel Co., Detroit, Mich.

RELAYS (Pressure and Vacuum).
Cutler-Hammer Mfg. Co., Milwaukee, Wis.

RETORTS (Cast Iron).
Buffalo Foundry & Mach. Co., Buffalo, N. Y.

RHEOSTATS.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.

RINGS (Steel and Forged).
Akron-Selle Co., The, Akron, O.

RINGS (Steel, Weldless).
Bay City Forge Co., Erie, Pa.

RIVETING MACHINERY.
Allen, John F., Co., New York, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cleveland Pneumatic Tool Co., Cleveland, O.
Oldham, Geo., & Sons Co., Frankford, Philadelphia, Pa.
Shuster, The F. B., Co., New Haven, Conn.
Southwark Fdy. & Mch. Co., Philadelphia, Pa.
Wood, R. D., & Co., Philadelphia, Pa.

RIVETS.
American Vanadium Co., The, Pittsburgh, Pa.
Bourne-Fuller Co., The, Cleveland, O.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.
National Bolt & Nut Co., Pittsburgh, Pa.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Progressive Mfg. Co., Torrington, Conn.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.

RODS.
United Smelting & Aluminum Co., New Haven, Conn.

RODS (Brass, Bronze and Aluminum)
Cleveland Brass & Copper Mills, Inc., Cleveland, O.

RODS (Connecting).
Bay City Forge Co., Erie, Pa.

RODS (Drill).
Aborn Steel Co., Inc., New York, N. Y.
Bourne-Fuller Co., The, Cleveland, O.
Century Steel Co. of America, New York.
Kidd Drawn Steel Co., Aliquippa, Pa.
Pittsburgh Tool Steel Wire Co., Monaca, Pa.

RODS (Iron and Steel).
American Steel Export Co., New York City.
American Steel & Wire Co., Chicago, Ill.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Federal Export Corporation, New York City.
Liberty Steel Products Co., New York.
Upson Nut Co., Cleveland, O.
Vulcan Steel Products Co., New York, N. Y.
Youngstown Sh't & Tube Co., Youngstown, O.

ROLLING MILLS (For Laboratory Use).
Crocker, Samuel A., Co., Cincinnati, O.

ROLLING MILL EQUIPMENT.
Abramsen Engrg. Co., Pittsburgh, Pa.
Alliance Machine Co., Alliance, O.
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Ct.
Fawcus Machine Co., Pittsburgh, Pa.
Garrison, A., Foundry Co., Pittsburgh, Pa.
Hubbard Steel Fdy. Co., E. Chicago, Ind.
Hyde Park Fdy. & Mch. Co., Hyde Park, Pa.
Industrial Works, Bay City, Mich.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., Alliance, O.
National Roll & Foundry Co., Avonmore, Pa.
Newbold, R. S., & Son Co., Norristown, Pa.
Standard Engineering Co., Ellwod City, Pa.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wellman-Seaver-Morgan Co., Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Youngstown Fdy. & Mch. Co., Youngstown, O.

ROLLING MILL TABLES.
Treadwell Engineering Co., Easton, Pa.

ROLLS.
National Roll & Foundry Co., Avonmore, Pa.
Pittsburgh Iron & Steel Foundries Co., Pittsburgh, Pa.
Wheeling Mold & Foundry Co., Wheeling, W. Va.

ROLLS (Adamite).
Pittsburgh Iron & Steel Foundries Co., Pittsburgh, Pa.

ROLLS (Bending and Straightening).
New York Machinery Exchange, Inc., New York, N. Y.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wickes Brothers, Saginaw, Mich.

ROLLS (Forged Steel).
Bay City Forge Co., Erie, Pa.

ROLLS (Sand Chilled and Steel).
American Steel Foundries, Chicago, Ill.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Farrel Fdy. & Mach. Co., Ansonia, Conn.
Garrison, A., Foundry Co., Pittsburgh, Pa.
Hubbard Steel Fdy. Co., E. Chicago, Ind.
Hyde Park Fdy. & Mch. Co., Hyde Park, Pa.
Mesta Machine Co., Pittsburgh, Pa.
National Roll & Foundry Co., Avonmore, Pa.
Pittsburgh Iron & Steel Foundries Co., Pittsburgh, Pa.
Pittsburgh Rolls Corporation, Pittsburgh, Pa.
Seaman, Sleeth & Co., Pittsburgh, Pa.
Standard Engrg. Co., Ellwood City, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Youngstown Fdy. & Mch. Co., Youngstown, O.

ROLLS (Wood).
Dart, E. M., Mfg. Co., Providence, R. I.

ROOFING AND SIDING (Composite).
American Sheet & Tin Plate Co., Pittsburgh.
Texas Company, The, New York City.

ROOFING AND SIDING (Iron and Steel).
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Brier Hill Steel Co., Youngstown, O.
Canton Sheet Steel Co., Canton, O.
Edwards Mfg. Co., The, Cincinnati, O.
Newport Rolling Mill Co., Newport, Ky.
Ryerson, Jos. T., & Son, Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Whitaker-Glessner Co., Wheeling, W. Va.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sh't & Tube Co., Youngstown, O.

ROOFING TIMBER (Creosoted).
Ayer & Lord Tie Co., Chicago.

ROPE DRESSING.
Macomber & Whyte Rope Co., Kenosha, Wis.
Texas Company, The, New York City.

RUBBER HAND STAMPS.
Moss, Henry, & Co., New York, N. Y.

RUNNING GEAR WHEELS, AXLES AND BEARINGS.
Lakewood Engrg. Co., Cleveland, O.

RUST PREVENTATIVES.
Pittsburgh Insulating Co., Pittsburgh.

SAFE ENDS (Boiler Tube).
National Tube Co., Pittsburgh.
Worth Brothers Co., Philadelphia, Pa.

SAFETY FIRST CLOTHING, GLOVES, MITTS.
Wheeler & Holcomb Co., Chicago.

SAND.
Enterprise Sand Co., Pittsburgh, Pa.
Gordon Sand Co., Inc., The, Conneaut, O.
Portage Silica Co., Youngstown, O.
Standard Sand & Machine Co., Cleveland, O

SAND BLAST (Shot).
Globe Steel Co., Mansfield, O.

SAND BLAST EQUIPMENT AND ACCESSORIES.
American Foundry Equipment Co., New York City
Hoevel Mfg. Corporation, New York City.
Pangborn Corporation, Hagerstown, Md.

SAND BLAST GLOVES.
Hickory Steel-Grip Glove Co., Chicago, Ill.

SAND BLAST ROOMS WITH REVOLVING TABLES.
American Fdy. Equip. Co., New York City.
Hoevel Mfg. Corporation, New York City.
Pangborn Corporation, Hagerstown, Md.

SAND BLAST SAND.
Portage Silica Co., The, Youngstown, O.

SAND BLAST TUMBLING BARRELS.
American Fdy. Equip. Co., New York City.
Hoevel Mfg. Corporation, New York City.
Pangborn Corporation, Hagerstown, Md.

SAND CONVEYING AND HANDLING MACHINERY.
Blaw-Knox Co., Pittsburgh, Pa.
Dunning, W. D., Syracuse, N. Y.
Link-Belt Company, Chicago, Ill.
Standard Sand & Machine Co., Cleveland, O.

SAND CUTTING MACHINERY.
American Foundry Equipment Co., New York City.

SAND DRYERS.
Indiana Foundry Co., Indiana, Pa.

SAND MIXING MACHINERY.
Blystone Mfg. Co., Cambridge Springs, Pa.
Dunning, W. D., Syracuse, N. Y.
National Engineering Co., Chicago.
Standard Sand & Machine Co., Cleveland, O.

SAND RECLAIMERS.
American Clay Machinery Co., Bucyrus, O.

SAND SIFTERS.
Arcade Mfg. Co., Freeport, Ill.
Blystone Mfg. Co., Cambridge Springs, Pa.
Dunning, W. D., Syracuse, N. Y.
Standard Sand & Machine Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

SASH (Steel Casement).
Trussed Concrete Steel Co., Detroit, Mich.

SAW BLADES (Inserted Tooth).
Disston, Henry & Sons, Inc., Philadelphia, Pa.
Hunter Saw & Machine Co., Pittsburgh.
Huther Bros. Saw Mfg. Co., Rochester, N. Y.

SAWS.
New York Machinery Exchange, Inc., New York, N. Y.
Simmons Machine Co., Inc., Albany, N. Y.

SAWS (Cold and Hot Metal).
Disston, Henry & Sons, Inc., Philadelphia, Pa.
Espen-Lucas Mch. Works, Philadelphia, Pa.
Hunter Saw & Machine Co., Pittsburgh, Pa.
Huther Bros. Saw Mfg. Co., Rochester, N. Y.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
National Roll & Foundry Co., Avonmore, Pa.
Newton Mach. Tool Works, Inc., Philadelphia.
Peerless Machine Co., Racine, Wis.
Racine Tool & Machine Co., Racine, Wis.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

SAW SHARPENING MACHINERY.
Disston, Henry, & Sons, Inc., Philadelphia, Pa.
Hunter Saw & Machine Co., Pittsburgh.

SCALES.
Standard Scale & Supply Co., Pittsburgh, Pa.

SCALES, CARS AND BOXES.
Lakewood Engrg. Co., Cleveland, O.

SCRAP RECLAIMING EQUIPMENT.
Southwark Foundry & Mach. Co., Philadelphia.

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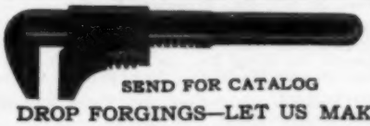

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Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Company, Chicago, Ill.
Standard Scale & Supply Co., Pittsburgh, Pa.

SCREENS (Coal and Sand).
Erdle Perforating Co., Rochester, N. Y.
Link-Belt Company, Chicago, Ill.
Standard Sand & Machine Co., Cleveland, O.
Wright Wire Co., Worcester, Mass.

SCREENS (Pulsating and Revolving).
Link-Belt Company, Chicago, Ill.
National Engineering Co., Chicago.

SCREENS (Water Intake).
Link-Belt Company, Chicago, Ill.

SCREW MACHINE PRODUCTS.
Automatic Products Co., Detroit, Mich.
Barnes, Wallace, Co., The, Bristol, Conn.
Co-operative Engineering Co., Inc., New York.
Corbin Screw Corporation, New Britain, Conn.
Metal Machining Co., The, Cleveland, O.
Metal Machining Tool Co., Cleveland, O.
St. Louis Screw Co., St. Louis, Mo.
Standard Screw Products Co., Detroit, Mich.

SCREW MACHINES.
Acme Machine Tool Co., Cincinnati, O.
New York Machinery Exchange, Inc., New York, N. Y.
Simmons Machine Co., Inc., Albany, N. Y.
Warner & Swasey Co., Cleveland, O.

SCREWS.
Clark Bros. Bolt Co., Milldale, Conn.
Corbin Screw Corporation, New Britain, Ct.
Milton Mfg. Co., Milton, Pa.
Progressive Mfg. Co., Torrington, Conn.
Republic Iron & Steel Co., Youngstown, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

SCREWS (Cap and Set).
Automatic Products Co., Detroit, Mich.
St. Louis Screw Co., St. Louis, Mo.

SCREW STOCK (Free Cutting).
American Steel & Wire Co., Chicago, Ill.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Latshaw Steel & Metal Products Corp., New York, N. Y.

SCREW STOCK (Iron).
Westerman & Co., Lockport, N. Y.

SECOND HAND MACHINERY.
American Machy. Exch., New York.
Baird Machy. Co., Pittsburgh, Pa.
Birtwell, W. L., Philadelphia, Pa.
Bockins, S. A., Pittsburgh, Pa.
Carrell & Co., W. A., Pittsburgh, Pa.
Castle & Wilson, Pittsburgh, Pa.
Davis, W. F., Machine Tool Co., New York.
Graves Machinery Exchange, New York City.
Green, L. A., Pittsburgh.
Hollander Mchy. Co., New York.
Luther, Frederick P., Co., Chicago.
Machinery Utilities Co., New York City.
Mitchell-Tappen Co., New York City.
Modern Machinery Exchange, New York.
New Jersey Machinery Exchange, Newark, N. J.
New York Machy. Exchange, New York City.
Niles-Bement-Pond Co., New York, N. Y.
Pettler, P., & Son, Beaver Falls, Pa.
Power Equipment Co., Philadelphia, Pa.
Riverside Mchy. Depot, Detroit.
Russell Machine Co., Pittsburgh.
Ryerson, Jos. T., & Son, Chicago, Ill.
Schlieper Engrg. Co., Pittsburgh.
Scully-Jones Co., Chicago.
Simmons Machine Co., Inc., Albany, N. Y.
Steam & Electrical Machinery Co., Bay City, Mich.
Toomey, Frank, Inc., Philadelphia, Pa.
Torbert, A. C., Chicago, Ill.
Wayne Machinery Co., Fort Wayne, Ind.
Zelnicker, Walter A., Supply Co., St. Louis, Mo.

SEMI STEEL.
McLain's System, Inc., Milwaukee, Wis.

SET AND CAP SCREW IRON.
Westerman & Co., Lockport, N. Y.

SHAFT HANGERS.
New Departure Mfg. Co., Bristol, Conn.

SHAFTING.
American Vanadium Co., The, Pittsburgh, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., The, Cleveland, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Cumberland Steel Co., Cumberland, Md.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Latshaw Steel & Metal Products Corp., New York, N. Y.
National Tube Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Standard Gauge Steel Co., Beaver Falls, Pa.
Union Drawn Steel Co., Beaver Falls, Pa.
Ward's, Edgar T., Sons, Co., Boston, Mass.

SHAPERS.
Cleveland Punch & Shear Works Co., Cleveland, O
Manning, Maxwell & Moore Inc., New York, N. Y.
Morton Mfg. Co., Muskegon Heights, Mich.
Newton Mach. Tool Wks., Inc., Philadelphia.
New York Machinery Exchange, Inc., New York, N. Y.
Niles-Bement-Pond Co., New York, N. Y.
Simmons Machine Co., Inc., Albany, N. Y.
Toomey, Frank, Inc., Philadelphia, Pa.

SHAPES (Iron and Steel).
American Vanadium Co., The, Pittsburgh, Pa.
Belmont Iron Works, Philadelphia, Pa.
Bourne-Fuller Co., The, Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Chesapeake Iron Works, Baltimore, Md.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Empire Art Metal Co., Inc., College Pt., N. Y.
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.
Laclede Steel Co., St. Louis, Mo.
Moltrup Steel Products Co., Beaver Falls, Pa.
Phoenix Iron Co., Philadelphia, Pa.
Republic Iron & Steel Co., Youngstown, O.
Scully Steel & Iron Co., Chicago, Ill.
Youngstown Sh't & Tube Co., Youngstown, O.

SHAPES (Special Form).
Empire Art Metal Co., Inc., College Pt., N. Y.

SHEAR BLADES AND KNIVES.
Heppenstall Forge & Knife Co., Pittsburgh.
Tinker, F. & Sons Co., Pittsburgh, Pa.
White, L. & I. J., Co., Buffalo, N. Y.

SHEARS.
Bliss, E. W., Co., Brooklyn, N. Y.
Erie Foundry Co., Erie, Pa.
Garrison, A., Foundry Co., Pittsburgh, Pa.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Mesta Machine Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
New York Machinery Exchange, Inc., New York, N. Y.
Simmons Machine Co., Inc., Albany, N. Y.
Toledo Machine & Tool Co., Toledo, O.
Treadwell Engineering Co., Easton, Pa.
United Engrg. & Fdy. Co., Pittsburgh, Pa.
Youngstown Fdy. & Mch. Co., Youngstown, O.

SHEET BARS.
Carnegie Steel Co., Pittsburgh, Pa.
Central Steel Co., The, Massillon, O.
Illinois Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Lackawanna Steel Co., Buffalo, N. Y.
Mudge, Edmund W., & Co., Pittsburgh, Pa.
Republic Iron & Steel Co., Youngstown, O.
Tenn. Coal, Iron & R. R. Co., Birmingham, Ala.
Vulcan Steel Products Co., New York, N. Y.

SHEET METAL STRAIGHTENER.
Shuster, The F. B. Co., New Haven, Conn.

SHEET METAL WORKING MACHINERY.
National Roll & Foundry Co., Avonmore, Pa.

SHEET MILL EQUIPMENT.
Treadwell Engineering Co., Easton, Pa.

SHEET ZINC.
United Smelting & Aluminum Co., New Haven, Conn.

SHEETS.
Allegheny Steel Co., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
American Vanadium Co., The, Pittsburgh, Pa.
Bourne-Fuller Co., The, Cleveland, O.
Canton Sheet Steel Co., Canton, O.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago, Ill.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., Chicago, Ill.
La Belle Iron Works, Steubenville, O.
Latshaw Steel & Metal Products Corp., New York, N. Y.
Mansfield Sheet & Tin Plate Co., Mansfield, O.
Nagel Steel Co., Pottstown, Pa.
Newport Rolling Mill Co., Newport, Ky.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Tenn. Coal, Iron & R. R. Co., Birmingham, Ala.
Trumbull Steel Co., Warren, O.
Whitaker-Glessner Co., Wheeling, W. Va.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sh't & Tube Co., Youngstown, O.

SHEETS (Black).
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., The, Cleveland, O.
Brier Hill Steel Co., Youngstown, O.
Canton Sheet Steel Co., Canton, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
Inland Steel Co., Chicago, Ill.
Mansfield Sh't & Tin Plate Co., Mansfield, O.
Newport Rolling Mill Co., Newport, Ky.
Ryerson, Jos. T., & Son, Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Vulcan Steel Products Co., New York, N. Y.
Wheeling Steel & Iron Co., Wheeling, W. Va.
Whitaker-Glessner Co., Wheeling, W. Va.
Youngstown Sh't & Tube Co., Youngstown, O.

SHEETS (Blue Annealed).
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., The, Cleveland, O.
Canton Sheet Steel Co., Canton, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
Newport Rolling Mill Co., Newport, Ky.
Ryerson, Jos. T., & Son, Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Whitaker-Glessner Co., Wheeling, W. Va.
Youngstown Sh't & Tube Co., Youngstown, O.

SHEETS (Brass and Copper).
Cleveland Brass & Copper Mills, Inc., Cleveland, O.

SHEETS (Cold Rolled).
Bourne-Fuller Co., The, Cleveland, O.
Inland Steel Co., Chicago, Ill.
Stark Rolling Mill Co., Canton, O.
Youngstown Sh't & Tube Co., Youngstown, O.

SHEETS (Corrugated).
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., The, Cleveland, O.
Brier Hill Steel Co., Youngstown, O.
Canton Sheet Steel Co., Canton, O.
Cincinnati Iron & Steel Co., Cincinnati, O.
Inland Steel Co., Chicago, Ill.
Newport Rolling Mill Co., Newport, Ky.
Ryerson, Joseph T., & Son, Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Tenn. Coal, Iron & R. R. Co., Birmingham, Ala.
Trumbull Steel Co., Warren, O.
Whitaker-Glessner Co., Wheeling, W. Va.
Youngstown Sh't & Tube Co., Youngstown, O.

SHEETS (Dead Soft).
American Rolling Mill Co., Middletown, O.
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., The, Cleveland, O.
Canton Sheet Steel Co., Canton, O.
Mansfield Sh't & Tin Plate Co., Mansfield, O.
Newport Rolling Mill Co., Newport, Ky.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Ward's, Edgar T., Sons, Co., Boston, Mass.
Whitaker-Glessner Co., Wheeling, W. Va.
Youngstown Sh't & Tube Co., Youngstown, O.

SHEETS (Galvanized).
Allegheny Steel Co., Pittsburgh, Pa.
American Sheet & Tin Plate Co., Pittsburgh.
Bourne-Fuller Co., The, Cleveland, O.
Brier Hill Steel Co., Youngstown, O.
Canton Sheet Steel Co., Canton, O.
Inland Steel Co., Chicago, Ill.
Newport Rolling Mill Co., Newport, Ky.
Ryerson, Jos. T., & Son, Chicago, Ill.
Seneca Iron & Steel Co., Buffalo, N. Y.
Stark Rolling Mill Co., Canton, O.
Trumbull Steel Co., Warren, O.
Vulcan Steel Products Co., New York, N. Y.
Whitaker-Glessner Co., Wheeling, W. Va.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sh't & Tube Co., Youngstown, O.

SHEETS (Long Terne).
Canton Sheet Steel Co., Canton, O.

SHEETS (Nickel).
Newport Rolling Mill Co., Newport, Ky.

SHEETS (Perforated).
Erdle Perfoating Co., Rochester, N. Y.

SHEETS (Polished and Planished).
American Rolling Mill Co., Middletown, O.
Bourne-Fuller Co., The, Cleveland, O.
Mansfield Sh't & Tin Plate Co., Mansfield, O.

SHEETS (Roofing). (See Roofing and Siding).

SHEET IRON WORK.
Hendrick Mfg. Co., Carbondale, Pa.

SHEET METAL WORKING MACHINERY.
Bliss, E. W., Co., Brooklyn, N. Y.

SHELVING (Steel).
Edward Mfg. Co., The, Cincinnati, O.
Empire Art Metal Co., Inc., College Pt., N. Y.
New Britain Mach. Co., New Britain, Conn.

SHINGLES (Galvanized and Terne Painted).
Canton Sheet Steel Co., Canton, O.

SHOP BOXES AND CANS.
New Britain Machine Co., New Britain, Conn.

SILICO-MANGANESE.
Pacific Electro Metals Co., San Francisco.

SILICON (Ferro).
Southern Ferro Alloys Co., Chattanooga, Tenn.
U. S. Alloys Corporation, New York City.

SILVER (Boronic Alloy in Shot Form).
American Boron Products Co., Inc., Reading, Pa.

SKIM GATES.
Erdle Perforating Co., Rochester, N. Y.

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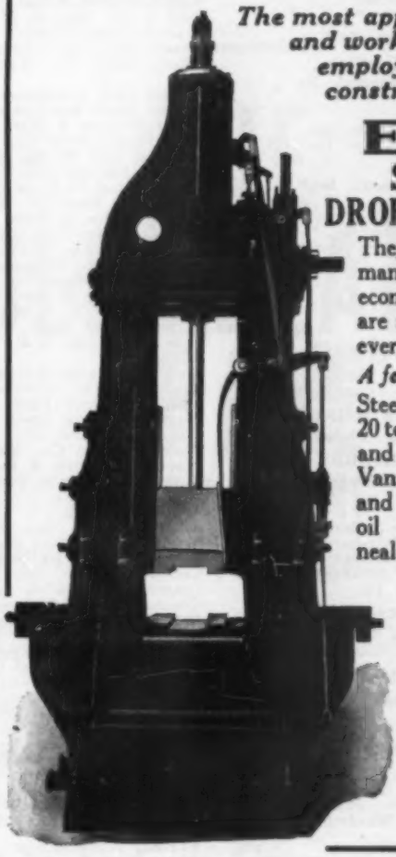

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Liberty Steel Products Co., New York.
Mudge, Edmund W., & Co., Pittsburgh, Pa.
Tenn. Coal, Iron & R. R. Co., Birmingham, Ala.
Vulcan Steel Products Co., New York, N. Y.
Whitaker-Glessner Co., Wheeling, W. Va.
Youngstown Sh't & Tube Co., Youngstown, O.

SLEEPERS (Creosoted).
Ayer & Lord Tie Co., Chicago.

SLEEVES AND NOZZLES.
Manown Mfg. Co., Pittsburgh, Pa.

SLITTING CUTTERS (Circular).
Tinker, F. & Sons Co., Pittsburgh, Pa.

SLOTTERS.
New York Machinery Exchange, Inc., New York, N. Y.

SOCKETS (Drill).
Clark Equipment Co., Buchanan, Mich.

SOLDER.
United Smelting & Aluminum Co., New Haven, Conn.

SPELTER.
United Smelting & Aluminum Co., New Haven, Conn.

SPIKES
American Steel & Wire Co., Chicago, Ill.
Illinois Steel Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.
Republic Iron & Steel Co., Youngstown, O.

SPOKE WIRE FOR WIRE WHEELS.
American Steel & Wire Co., Chicago, Ill.

SPRING COILING MACHINERY.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRINGS.
American Steel & Wire Co., Chicago, Ill.
American Vanadium Co., Pittsburgh, Pa.
Barnes, Wallace Co., The, Bristol, Conn.
Duer Spring & Mfg. Co., Pittsburgh, Pa.
Raymond Mfg. Co., Corry, Pa.

SPROCKET AND TRACTION WHEELS.
Lehigh Car, Wheel & Axle Works, Catasauqua, Pa.

SQUEEZER MOLDING MACHINES.
Pridmore, Henry E., Chicago, Ill.

SQUEEZERS (Power).
Pridmore, Henry E., Chicago, Ill.

STACKS (Steel).
American Bridge Co., New York, N. Y.
Lindsay, W. W., Co., Inc., Philadelphia.
Phoenix Iron Works Co., Meadville, Pa.

STAMPINGS (Sheet Metal).
American Tube & Stamping Co., Bridgeport, Conn.
Bettcher Mfg. Co., Cleveland, O.
Bossert Corporation, The, Utica, N. Y.
Burr Mfg. Co., The, Cleveland, O.
Conway Stove Co., The, Bellevue, O.
Co-operative Engineering Co., Inc., New York.
Empire Art Metal Co., Inc., College Pt., N. Y.
Erdle Perforating Co., Rochester, N. Y.
Fouts, C. C., Company, Middletown, O.
Gem Mfg. Co., Pittsburgh, Pa.
Lansing Stamping & Tool Co., Lansing, Mich.
New Britain Mch. Co., New Britain, Conn.
Worcester Stamped Metal Co., Worcester, Mass.

STAMPS (Steel).
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Moss, Henry & Co., New York, N. Y.
Pannier Brothers Stamp Co., Pittsburgh, Pa.

STAMP HOLDERS (Steel).
Moss, Henry & Co., New York, N. Y.
Pannier Bros. Stamp Co., Pittsburgh, Pa.

STAMP SHOES AND DIES.
Midvale Steel Co., Philadelphia, Pa.

STAPLES.
American Steel & Wire Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.
Youngstown Sh't & Tube Co., Youngstown, O.

STARS (Hard Iron).
Fanner Mfg. Co., Cleveland, O.

STARTERS (Electric Motor).
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

STEAMSHIP AGENTS.
Grandfield, W. J., & Co., Philadelphia, Pa.

STEEL.
American Bridge Co., New York, N. Y.
American Vanadium Co., Pittsburgh, Pa.
Andrews Steel Co., Newport, Ky.
Beals, McCarthy & Rogers, Buffalo, N. Y.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., The, Cleveland, O.
Cambria Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Central Steel Co., The, Massillon, O.
Century Steel Co. of America, New York.
Chicago Metal Treating Co., Chicago, Ill.
Cincinnati Steel Castings Co., Cincinnati, O.
Columbia Steel & Shafting Co., Pittsburgh.
Federal Export Corporation, New York, N. Y.
Ferguson Steel & Iron Co., Buffalo, N. Y.
Ford & Co., Inc., R. M., New York, N. Y.
Franklin Steel Works, Franklin, Pa.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago, Ill.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Interstate Iron & Steel Co., Chicago, Ill.
Kidd Drawn Steel Co., Aliquippa, Pa.
La Belle Iron Works, Steubenville, O.
Latrobe Electric Steel Co., Latrobe, Pa.
Liberty Steel Products Co., New York.
Lindenberg Steel Co., New York City.
Lockhart Iron & Steel Co., McKees Rocks, Pa.
Metals Service Co., Cleveland, O.
Nagle Steel Co., Pottstown, Pa.
Otis Steel Co., Cleveland, O.
Pacific Coast Steel Co., San Francisco, Cal.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Jos. T., & Son, Chicago, Ill.
Superior Steel Corp., Pittsburgh.
Tenn. Coal, Iron & R. R. Co., Birmingham, Ala.
United Alloys Steel Corp., The, Canton, O.
Upson Nut Co., Cleveland, O.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
West Leechburg Steel Co., Pittsburgh, Pa.
Whitaker-Glessner Co., Wheeling, W. Va.
Wickwire Steel Co., Buffalo, N. Y.
Wood, Alan, Iron & Steel Co., Philadelphia.
Youngstown Sh't & Tube Co., Youngstown, O.

STEEL (Alloy).
Aborn Steel Co., Inc., New York, N. Y.
American Vanadium Co., Pittsburgh, Pa.
Andrews Steel Co., Newport, Ky.
Central Steel Co., The, Massillon, O.
Century Steel Co. of America, New York.
Cincinnati Steel Castings Co., Cincinnati, O.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Crowley, John A., Co., New York City.
General Steel Co., Milwaukee, Wis.
Latrobe Electric Steel Co., Latrobe, Pa.
Midvale Steel Co., Philadelphia, Pa.
National Pressed Steel Co., Massillon, O.
Ohio Seamless Steel Tube Co., Shelby, O.
Union Drawn Steel Co., Beaver Falls, Pa.
United Alloys Steel Corp., The, Canton, O.
Union Electric Steel Co., Pittsburgh, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.

STEEL (Alloy, Stellite).
Haynes Stellite Co., The, Kokomo, Ind.

STEEL (Carbon).
Aborn Steel Co., Inc., New York, N. Y.
Century Steel Co. of America, New York.

STEEL (Cold Drawn).
Aborn Steel Co., Inc., New York, N. Y.
Barnes, Wallace, Co., The, Bristol, Conn.
Bourne-Fuller Co., The, Cleveland, O.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Kidd Drawn Steel Co., Aliquippa, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Ohio Seamless Tube Co., The, Shelby, O.
Pittsburgh Cold Rolled Steel Co., Pittsburgh.
Rome Metal Products Co., Inc., New York, N. Y.
Scully Steel & Iron Co., Chicago, Ill.
Standard Gauge Steel Co., Beaver Falls, Pa.
Superior Steel Corp., Pittsburgh, Pa.
Union Drawn Steel Co., Beaver Falls, Pa.
United Alloys Steel Corp., The, Canton, O.
West Leechburg Steel Co., Pittsburgh, Pa.

STEEL (Crucible).
Century Steel Co. of America, New York.

STEEL (Die).
Century Steel Co. of America, New York.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.

STEEL (Electric Furnace).
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Connecticut Electric Steel Co., Inc., Hartford, Conn.
Crowley, John A., Co., New York City.
Ford, R. M., & Co., Inc., New York, N. Y.
General Steel Co., Milwaukee, Wis.
Illinois Steel Co., Chicago, Ill.
Latrobe Electric Steel Co., Latrobe, Pa.
Union Electric Steel Co., Pittsburgh, Pa.
United Alloys Steel Corp., The, Canton, O.

STEEL (High Speed).
Aborn Steel Co., Inc., New York, N. Y.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., The, Cleveland, O.
Century Steel Co. of America, New York.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Lindenberg Steel Co., New York City.
Midvale Steel Co., Philadelphia, Pa.
Onondaga Steel Co., Syracuse, N. Y.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Ward's, Edgar T., Sons, Co., Boston, Mass.

STEEL (High Speed—Reclaimed).
Onondaga Steel Co., Syracuse, N. Y.

STEEL (High Speed, Stellite).
Haynes Stellite Co., The, Kokomo, Ind.

STEEL (Open-Hearth).
Andrews Steel Co., Newport, Ky.
Bourne-Fuller Co., The, Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
Inland Steel Co., Chicago, Ill.
Mitchell-Tappen Co., New York, N. Y.
Nagle Steel Co., Pottstown, Pa.
National Pressed Steel Co., Massillon, O.
Union Drawn Steel Co., Beaver Falls, Pa.
Upson Nut Co., Cleveland, O.
Whitaker-Glessner Co., Wheeling, W. Va.

STEEL (Spring).
Aborn Steel Co., Inc., New York, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Rome Metal Products Co., Inc., New York, N. Y.
United Alloys Steel Corp., The, Canton, O.

STEEL STAMPINGS.
American Tube & Stamping Co., Bridgeport, Conn.
Griffin Mfg. Co., Erie, Pa.
Kempsmith Mfg. Co., Milwaukee, Wis.
McCord & Co., Chicago, Ill.

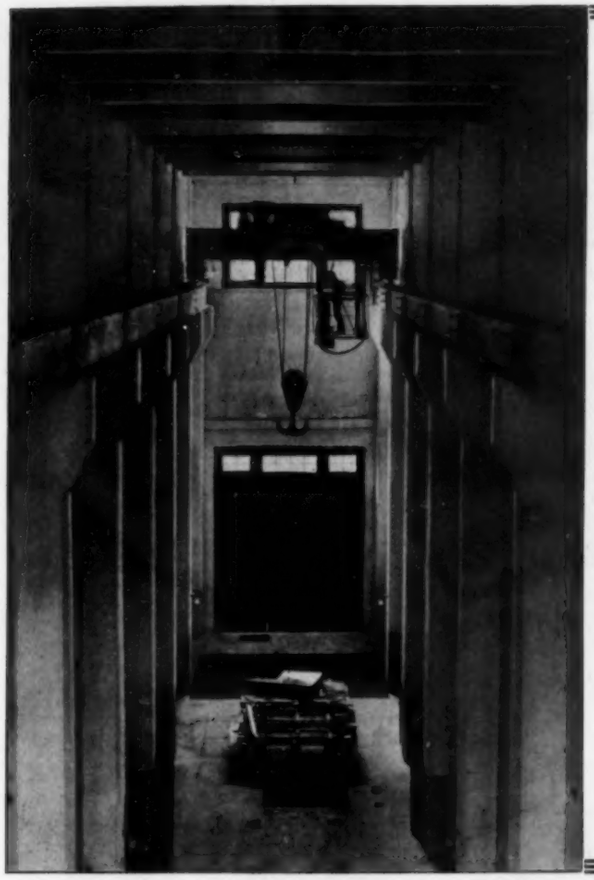
STEEL, STRIP (Hot and Cold Rolled).
American Tube & Stamping Co., Bridgeport, Conn.
Griffin Mfg. Co., The, Erie, Pa.
National Pressed Steel Co., Massillon, O.
Rome Metal Products Co., Inc., New York, N. Y.
Superior Steel Corp., Pittsburgh.
West Leechburg Steel Co., Pittsburgh, Pa.

STEEL (Structural).
Alliance Structural Co., Alliance, O.
American Bridge Co., New York, N. Y.
Amiron Supply Co., Inc., New York, N. Y.
Bellefontaine Bridge & Steel Co., The, Bellefontaine, O.
Belmont Iron Works, Philadelphia, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Blaw-Knox Co., Pittsburgh, Pa.
Bourne-Fuller Co., The, Cleveland, O.
Cambria, Steel Co., Philadelphia, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Chesapeake Iron Works, Baltimore, Md.
Cincinnati Iron & Steel Co., Cincinnati, O.
Empire Art Metal Co., Inc., College Pt., N. Y.
Ferguson Steel & Iron Co., Buffalo, N. Y.
Franklin Steel Works, Franklin, Pa.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago, Ill.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Kratzer, W. N., Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
McClintic-Marshall Co., Pittsburgh, Pa.
Newton Falls Construction Co., Newton Falls, O.
Phoenix Iron Co., The, Philadelphia, Pa.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Snead Architectural Iron Works, Louisville, Ky.
Tenn. Coal, Iron & R. R. Co., Birmingham, Ala.
Whitaker-Glessner Co., Wheeling, W. Va.

STEEL (Tool).
Aborn Steel Co., Inc., New York, N. Y.
American Steel Export Co., New York City.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., The, Cleveland, O.
Century Steel Co. of America, New York.
Cincinnati Iron & Steel Co., Cincinnati, O.
Columbia Steel & Shafting Co., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
General Steel Co., Milwaukee, Wis.
Latrobe Electric Steel Co., Latrobe, Pa.
Lindenberg Steel Co., New York City.
Metals Service Co., Cleveland.
Midvale Steel Co., Philadelphia, Pa.
Ryerson, Joseph T., & Sons, Chicago, Ill.
United Alloy Steel Corporation, Canton, O.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Ward's, Edgar T., Sons, Co., Boston, Mass.

STEEL (Tool, Stellite).
Haynes Stellite Co., The, Kokomo, Ind.

See Index to Advertisements for Pages Containing Advertisements of Companies Listed Above



85-Ton
Cleveland Crane

THE
CLEVELAND
CRANE
& ENGINEERING CO.
WICKLIFFE, O.
50 Church St., New York
First Nat'l Bank Bldg., Pittsburg

CHESAPEAKE CRANES
5 to 25 Tons Capacity
Direct Current Electric Traveling Cranes
Most Rugged Crane Built
QUICK DELIVERY
CHESAPEAKE IRON WORKS, Baltimore, Md.

NILES CRANES

Ask for Catalogue
2 TO 200 TONS CAPACITY
NILES-BEMENT-POND CO., 111 Broadway, New York
Boston Philadelphia Birmingham Pittsburgh Cincinnati Cleveland Detroit Chicago St. Louis San Francisco

STEEL (Tungsten).
Century Steel Co. of America, New York.

STEEL BUILDINGS.
Arnold Co., The, Chicago, Ill.
Austin Co., The, Cleveland, O.
Trussed Concrete Steel Co., Detroit, Mich.

STEEL PLANT CONSTRUCTION.
Arnold Co., The, Chicago, Ill.
Austin Co., The, Cleveland, O.
Lindsay, W. W., Co., Inc., Philadelphia.

STEEL PLATE CONSTRUCTION.
Blaw-Knox Co., Pittsburgh, Pa.
Camden Boiler Works, Inc., Camden, N J.
Colonial Iron Works Co., Cleveland, O.
Lindsay, W. W., Co., Inc., Philadelphia.
Pennsylvania Engrg. Works, New Castle, Pa.

STEEL STRUCTURAL WORK.
Arnold Co., The, Chicago, Ill.
Austin Co., The, Cleveland, O.
Lindsay, W. W., Co., Inc., Philadelphia.

STELLITE.
Haynes Stellite Co., The, Kokomo, Ind.

STENCILS (Brass and Rubber).
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Moss, Henry, & Co., New York, N. Y.

STILLS (Cast Iron).
Buffalo Foundry & Mach. Co., Buffalo, N. Y.

STOKERS.
Babcock & Wilcox Co., The, New York City.
Erie Foundry Co., Erie, Pa.
Green Engineering Co., E. Chicago, Ind.
Hagan, Geo. J., Co., Pittsburgh, Pa.

STOVE TRIMMINGS.
Fanner Mfg. Co., Cleveland, O.

STRAIGHTENING MACHINERY.
Abramsen Engineering Co., Pittsburgh, Pa.
Shuster, The F. B., Co., New Haven, Conn.

STRAPS (Connecting).
Bay City Forge Co., Erie, Pa.

STRIP STEEL.
American Steel & Wire Co., Chicago, Ill.

STRIP STEEL STRAIGHTENERS.
Shuster, The F. B., Co., New Haven, Conn.

STRUCTURAL TIMBERS (Creosoted).
Ayer & Lord Tie Co., Chicago.

SULPHATE OF IRON.
American Steel & Wire Co., Chicago, Ill.

SWITCHBOARDS.
Electric Controller & Mfg. Co., Cleveland, O.

SWITCHES (Electric).
Electric Controller & Mfg. Co., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

SWITCH STANDS.
Bethlehem Steel Co., The, So. Bethlehem, Pa.

SYNDOLAG.
Davison, Allen S., Co., Pittsburgh, Pa.

TACKS.
American Steel & Wire Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.

TANKS.
Air Tight Steel Tank Co., Pittsburgh, Pa.
American Bridge Co., New York, N. Y.
Hauser-Stander Tank Co., The, Cincinnati, O.
Morgan Construction Co., Worcester, Mass.
National Tube Co., Pittsburgh, Pa.
Phoenix Iron Works Co., Meadville, Pa.
Riter-Conley Mfg. Co., Pittsburgh, Pa.

TANKS (Acetylene).
Linde Air Products Co., New York, N. Y.
National Tube Co., Pittsburgh, Pa.
Oxweld Acetylene Co., Chicago, Ill.
Prest-O-Lite Co., The, Indianapolis, Ind.

TANKS (Gasoline and Oil Storage).
Air Tight Steel Tank Co., Pittsburgh, Pa.

TANKS (Pressure).
Air Tight Steel Tank Co., Pittsburgh, Pa.

TANKS (Wooden).
Hauser-Stander Tank Co., Cincinnati, O.

TAPPING MACHINES.
New York Machinery Exchange, Inc., New York, N. Y.

TAR EXTRACTORS.
Smith Gas Engrg. Co., The, Lexington, O.

TELEGRAPH AND TELEPHONE WIRE.
American Steel & Wire Co., Chicago, Ill.

THREAD CUTTING TOOLS.
Landis Machine Co., Waynesboro, Pa.

TIES (Creosoted).
Ayer & Lord Tie Co., Chicago, Ill.

TILE (Fire Clay).
Union Mining Co., Mt. Savage, Md.

TILE (Metal).
Trussed Concrete Steel Co., Detroit, Mich.

TIN.
United Smelting & Aluminum Co., New Haven, Conn.

TINNED WIRE (Equipment).
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

TIN PLATE.
American Sheet & Tin Plate Co., Pittsburgh.
American Steel Co., Pittsburgh, Pa.
American Steel Export Co., New York City.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Liberty Steel Co., The, Warren, O.
Standard Tin Plate Co., Canonsburg, Pa.
Taylor, N. & G., Co., Inc., Philadelphia, Pa.
Trumbull Steel Co., The, Warren, O.
Vulcan Steel Products Co., New York, N. Y.
Wheeling Steel & Iron Co., Wheeling, W. Va.

TIN PLATE MILL EQUIPMENT.
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
National Roll & Fdy. Co., Avonmore, Pa.
Treadwell Engineering Co., Easton, Pa.
United Eng. & Fdy. Co., Pittsburgh, Pa.

TIRES (Locomotive and Car Wheel).
American Vanadium Co., The, Pittsburgh, Pa.
Midvale Steel Co., The, Philadelphia, Pa.

TITANIUM.
Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

TOE CALK (Steel).
American Steel & Wire Co., Chicago, Ill.

TOOL BITS (High Speed).
Onondaga Steel Co., Syracuse, N. Y.

TOOL HOLDER BITS (Treated).
Vanadium-Alloys Steel Co., Pittsburgh, Pa.

TOOL HOLDERS.
Clark Equipment Co., Buchanan, Mich.
Williams, J. H., & Co., Brooklyn, N. Y.

TOOLS.
Cleveland Pneumatic Tool Co., Cleveland, O.
Co-operative Engineering Co., Inc., New York.
General Electric Co., Schenectady, N. Y.
Haynes Stellite Co., The, Kokomo, Ind.
Lansing Stamping & Tool Co., Lansing, Mich.
Oldham, Geo., & Sons Co., Frankford, Philadelphia, Pa.
Ryerson, Jos. T., & Son, Chicago, Ill.
Southwark Fdy. & Mch. Co., Philadelphia, Pa.
Way, A. F., Co., Inc., Hartford, Conn.
White, L. & I. J., Co., Buffalo, N. Y.
Williams, J. H., & Co., Brooklyn, N. Y.

TOOLS (Special).
Cleveland Milling Machine Co., Cleveland, O.

TORCHES (Acetylene, Blow, Oxy-acetylene).
Linde Air Products Co., New York, N. Y.
Oxweld Acetylene Co., Chicago, Ill.
Prest-O-Lite Co., The, Indianapolis, Ind.

TORCHES (Foundry).
Mahr Mfg. Co., Minneapolis, Minn.

TRACK AND RAIL SUPPLIES.
American Steel Export Co., New York City.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bourne-Fuller Co., The, Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Chase Foundry & Mfg. Co., Columbus, O.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Lackawanna Steel Co., Buffalo, N. Y.
Lakewood Engineering Co., Cleveland, O.
Republic Iron & Steel Co., Youngstown, O.
Tenn. Coal, Iron & R. R. Co., Birmingham, Ala.

TRAMRAILS (Overhead Systems).
Brown Hoisting Machinery Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

TRAMWAYS.
Link-Belt Company, Chicago, Ill.

TRAMWAYS (Wire Rope).
American Steel & Wire Co., Chicago, Ill.
Macomber & Whyte Rope Co., Kenosha, Wis.

TRANSFORMERS.
General Electric Co., Schenectady, N. Y.

TRANSMISSION CHAINS.
Link-Belt Company, Chicago, Ill.

TROLLEYS.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Milwaukee Electric Crane & Mfg. Co., Milwaukee, Wis.
Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.
Whiting Foundry Equipment Co., Harvey, Ill.

TROLLEY WHEELS.
Aluminum Castings Co., Cleveland.

TRUCKS (Foundry).
Lakewood Engineering Co., Cleveland, O.
Standard Scale & Supply Co., Pittsburgh, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.

TRUCKS (Industrial).
Atlas Car & Mfg. Co., Cleveland, O.
Lakewood Engr. Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.

TRUCKS (Motor).
Federal Motor Truck Co., Detroit, Mich.

TRUCKS (Wire Mill).
Lakewood Engineering Co., Cleveland, O.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

TRUCKS (Small Hand).
Lakewood Engineering Co., Cleveland, O.
Standard Scale & Supply Co., Pittsburgh, Pa.

TUBE MILL MACHINERY.
Standard Engrg. Co., Ellwood City, Pa.

TUBES.
Allegheny Steel Co., The, Pittsburgh, Pa.
American Steel Export Co., New York City.
American Vanadium Co., The, Pittsburgh, Pa.
Bourne-Fuller Co., The, Cleveland, O.
Detroit Seamless Steel Tube Co., Detroit, Mich.
Empire Art Metal Co., Inc., College Pt., N. Y.
Latshaw Steel & Metal Products Corp., New York, N. Y.
National Tube Co., Pittsburgh, Pa.
Ohio Seamless Tube Co., The, Shelby, O.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Jos. T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Toledo Steel Tube Co., Toledo, O.
Vulcan Steel Products Co., New York, N. Y.
Ward's, Edgar T., Sons, Co., Boston, Mass.
Wheeling Steel & Iron Co., Wheeling, W. Va.
Worth Brothers Co., Philadelphia, Pa.
Youngstown Sh't & Tube Co., Youngstown, O.

TUBES (Cold Drawn Seamless Steel).
Rome Metal Products Co., Inc., New York.

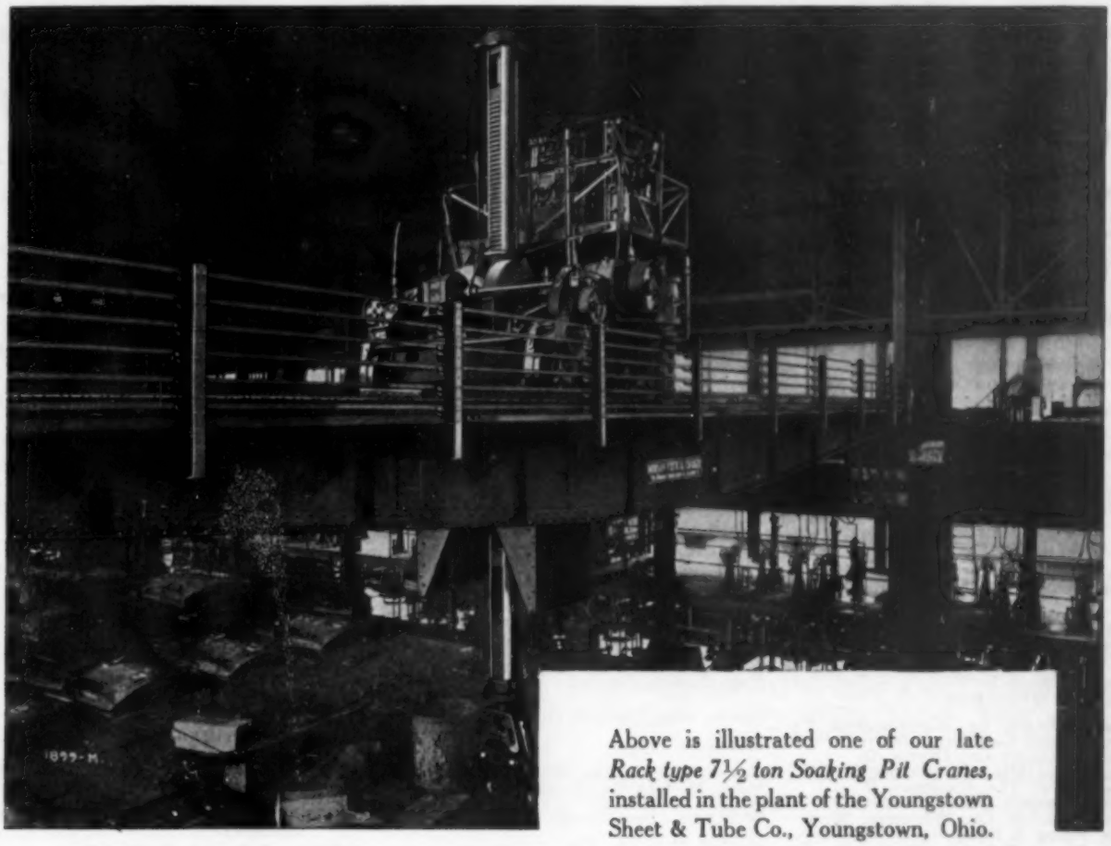
TUBES (Seamless Brazed Brass and Copper).
Cleveland Brass & Copper Mills, Inc., Cleveland, O.
Latshaw Steel & Metal Products Corp., New York, N. Y.

TUBS (Wire Mill Cleaning House).
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

TUMBLING MILLS.
Whiting Fdy. Equipment Co., Harvey, Ill.

TUNGSTEN ORE.
Vasco Mining Company, Boulder, Colo.

See Index to Advertisements for Pages Containing Advertisements of Companies Listed Above



Above is illustrated one of our late *Rack type 7½ ton Soaking Pit Cranes*, installed in the plant of the Youngstown Sheet & Tube Co., Youngstown, Ohio.

Morgan Crane
of course

There are **113 OF THESE CRANES IN 49 PLANTS**—a thing that could not be true, if they were not superior to others.

This Morgan Soaking Pit Crane has magnetic control throughout. There are no overhung gears. All gears are enclosed. Being "Rack" type, this crane is exclusively *a Morgan* product.

The first Morgan Soaking Pit Crane was installed 24 years ago—and it is still operating. This is the same kind of service that YOU get when YOU buy "Morgan" Equipment.

"Morgan Equipment is the World's Standard."

HEAVY FORGINGS
of every description furnished on short notice.

GRAY IRON and AIR FURNACE CASTINGS
up to 100 tons.

BRONZE CASTINGS
of every description.

Special Alloy and Acid Resisting Castings
for special purposes.

Steel Castings to meet all requirements.

PITTSBURGH, PA.
Oliver Building
BIRMINGHAM, ALA.
American Trust Bldg.
BRUSSELS, BELGIUM
COPENHAGEN
TOKIO

The MORGAN ENGINEERING COMPANY
ESTABLISHED 1868
Alliance, Ohio. U.S.A.

NEW YORK
120 Broadway
PETROGRAD
M. Mett & Co.
LONDON
PARIS

TURBINES (Steam).

General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TURNBUCKLES.

American Bridge Co., New York, N. Y.
Bourne-Fuller Co., The, Cleveland, O.
Merrill Brothers, Maspeth, N. Y.
Michigan Bolt & Nut Works, Detroit, Mich.
Republic Iron & Steel Co., Youngstown, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

TURNTABLES.

American Bridge Co., New York, N. Y.
Atlas Car & Mfg. Co., Cleveland, O.
Chase Foundry & Mfg. Co., Columbus, O.
Lakewood Engrg. Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.

UNDERFLOORING (Creosoted).

Ayer & Lord Tie Co., Chicago.

UNION COUPLINGS (Cold Drawn Steel).

Mark Mfg. Co., Evanston, Ill.

UNIONS (Pipe).

Dart, E. M., Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Mark Mfg. Co., Evanston, Ill.

VALVE LEATHERS.

Graton & Knight Mfg. Co., Worcester, Mass.
Scully Steel & Iron Co., Chicago, Ill.

VALVES (Gas and Air Reversing).

Wellman-Seaver-Morgan Co., Cleveland, O.

VALVES AND FITTINGS.

Chambersburg Engrg. Co., Chambersburg, Pa.
Connersville Blower Co., The, Connersville, Ind.
Dayton Steel Foundry Co., Dayton, O.
Homestead Valve Mfg. Co., Pittsburgh, Pa.
Lunkenheimer Co., The, Cincinnati, O.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Pittsburgh Piping & Equip. Co., Pittsburgh.
Southwark Fdy. & Mch. Co., Philadelphia, Pa.

VANADIUM.

American Vanadium Co., Pittsburgh, Pa.

VATS (Acid and Chemical).

Hauser-Stander Tank Co., The, Cincinnati, O.

VISES.

Cleveland Milling Machine Co., Cleveland, O.
Williams, J. H., & Co., Brooklyn, N. Y.

WASHED METAL.

Brier Hill Steel Co., Youngstown, O.

WASHER CUTTING MACHINES.

Southwark Foundry & Mach. Co., Philadelphia.

WASHERS (Iron and Steel).

Bettcher Mfg. Co., Cleveland, O.
Bourne-Fuller Co., The, Cleveland, O.
Griffin Mfg. Co., Erie, Pa.
Milton Mfg. Co., Milton, Pa.
Oliver Iron & Steel Co., Pittsburgh, Pa.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Upson Nut Co., Cleveland, O.
Wrought Washer Mfg. Co., Milwaukee, Wis.

WASHERS (Leather).

Graton & Knight Mfg. Co., The, Worcester, Mass.

WASHING MATERIAL (Rags).

Ford, J. B., Co., Wyandotte, Mich.

WATER CINDER MILLS.

Whiting Foundry Equipment Co., Harvey, Ill.

WATER COOLED STANDING (For Sheet and Tin Mills).

National Roll & Foundry Co., Avonmore, Pa.

WELDED PRODUCTS (Electric).

Standard Screw Products Co., Detroit, Mich.

WELDED STEEL PLATE CONSTRUCTION.

Blaw-Knox Co., Pittsburgh, Pa.

WELDING, AND CUTTING (Oxy-Acetylene).

Co-operative Engineering Co., Inc., New York.
Fouts, C. C., Company, Middletown, O.
Blaw-Knox Co., Pittsburgh, Pa.
Linde Air Products Co., New York, N. Y.
Modern Engrg. Co., St. Louis, Mo.
Oxweld Acetylene Co., Chicago, Ill.

WEIDING AND CUTTING APPARATUS (Electric).

General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

WELDING AND CUTTING APPARATUS (Oxy-Acetylene).

Linde Air Products Co., New York, N. Y.
Modern Engrg. Co., St. Louis, Mo.
Oxweld Acetylene Co., Chicago, Ill.
Prest-O-Lite Co., The, Indianapolis, Ind.

WET PANS.

American Clay Machinery Co., Bucyrus, O.

WHEELBARROWS.

Lakewood Engrg. Co., Cleveland, O.

WHEELS.

Treadwell Engineering Co., Easton, Pa.

WHEELS (Car and Locomotive).

American Steel Export Co., New York City.
American Steel Foundries, Chicago, Ill.
Carnegie Steel Co., Pittsburgh, Pa.
Midvale Steel Co., Philadelphia, Pa.
National Malleable Castings Co., Cleveland, O.
Pittsburgh Iron & Steel Foundries Co., Pittsburgh, Pa.
Vulcan Steel Products Co., New York, N. Y.

WHEELS (Rope).

Cooper, C. & G., Co., Mt. Vernon, O.
Mesta Machine Co., Pittsburgh, Pa.

WHEELS (Steel Tired).

Midvale Steel Co., Philadelphia, Pa.

WHEELS (Steel Truck).

Dayton Steel Foundry Co., Dayton, O.

WINDERS, LINK (Coil Chain).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

WIRE.

Roebling's Sons Co., John A., Trenton, N. J.
Latshaw Steel & Metal Products Corp., New York, N. Y.
Vulcan Steel Products Co., New York, N. Y.

WIRE (Barb and Fence).

American Steel & Wire Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.
Youngstown Sh't & Tube Co., Youngstown, O.

WIRE (Broom).

American Steel & Wire Co., Chicago, Ill.

WIRE (Enameled Magnet).

American Steel & Wire Co., Chicago, Ill.

WIRE (Fence).

American Steel & Wire Co., Chicago, Ill.
Interstate Iron & Steel Co., Chicago, Ill.

WIRE (Fence, Woven).

American Steel & Wire Co., Chicago, Ill.

WIRE (Fine).

American Steel & Wire Co., Chicago, Ill.

WIRE (Flat and Round).

American Steel & Wire Co., Chicago, Ill.

WIRE (Flat, High or Low Carbon).

American Steel & Wire Co., Chicago, Ill.

WIRE (Ignition).

American Steel & Wire Co., Chicago, Ill.

WIRE (Lath).

Wright Wire Co., Worcester, Mass.

WIRE (Mattress).

American Steel & Wire Co., Chicago, Ill.

WIRE (Piano and Music).

Aborn Steel Co., Inc., New York, N. Y.
American Steel & Wire Co., Chicago, Ill.

WIRE (Pipe Organ).

American Steel & Wire Co., Chicago, Ill.

WIRE (Rubber Covered).

American Steel & Wire Co., Chicago, Ill.

WIRE (Screw Driver).

American Steel & Wire Co., Chicago, Ill.

WIRE (Telephone and Telegraph).

American Steel & Wire Co., Chicago, Ill.

WIRE (Threaded).

Progressive Mfg. Co., Torrington, Conn.

WIRE (Vanadium).

American Vanadium Co., Pittsburgh, Pa.

WIRE (Weaving).

American Steel & Wire Co., Chicago, Ill.

WIRE AND CABLES (Electric).

American Steel & Wire Co., Chicago, Ill.

WIRE CLOTH.

Wright Wire Co., Worcester, Mass.

WIRE COILING MACHINERY.

Sleeper & Hartley, Inc., Worcester, Mass.

WIRE FENCE.

Wright Wire Co., Worcester, Mass.
Youngstown Sh't & Tube Co., Youngstown, O.

WIRE GRILLS (Window, Machinery, Tool Room).

Wright Wire Co., Worcester, Mass.

WIRE GUARDS.

Wright Wire Co., Worcester, Mass.

WIRE MILL MACRINERY.

Blake & Johnson Co., Waterbury, Conn.
Kilby Mfg. Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

WIRE MILL MACHINERY (Equipment Complete).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

WIRE NAIL MACHINERY (Equipment Complete).

Sleeper & Hartley, Inc., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

WIRE RODS (Steel).

American Steel & Wire Co., Chicago, Ill.
Vulcan Steel Products Co., New York, N. Y.

WIRE ROPE.

Macomber & Whyte Rope Co., Kenosha, Wis.
Roebling's Sons Co., John A., Trenton, N. J.

WIRE ROPE AND FITTINGS.

American Steel & Wire Co., Chicago, Ill.
Williamsport Wire Rope Co., Williamsport, Pa.
Wright Wire Co., Worcester, Mass.

WIRE STRAIGHTENING AND CUTTING MACHINES.

Shuster, The F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE, WIRE RODS AND WIRE PRODUCTS.

American Steel & Wire Co., Chicago, Ill.
Cambria Steel Co., Philadelphia, Pa.
Interstate Iron & Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Wickwire Steel Co., Buffalo, N. Y.
Youngstown Sh't & Tube Co., Youngstown, O.

WOOD BLOCKS (Creosoted).

Ayer & Lord Tie Co., Chicago.

WOODEN TANKS.

Hauser-Stander Tank Co., The, Cincinnati, O.

WRENCHES.

Lakeside Forge Co., Erie, Pa.
Williams, J. H., & Co., Brooklyn, N. Y.

WRENCHES (Pipe).

Drop Forging Co. of N. Y., Jersey City, N. J.
Williams, J. H., & Co., Brooklyn, N. Y.

WRENCHES (Reversible).

Lowell Wrench Co., Worcester, Mass.

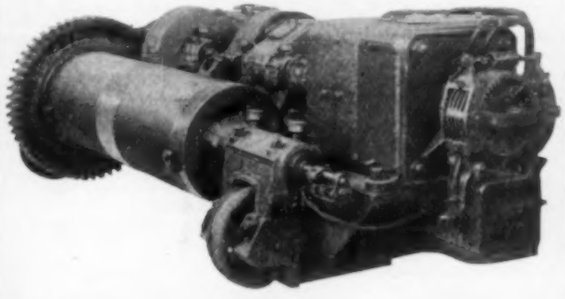
See Index to Advertisements for Pages Containing Advertisements of Companies Listed Above

CRANES

for all purposes

Electric and Hand Power

Case Standard Cranes are the result of thoroughly tested ideas secured during many years from the best designing and operating engineers. They are manufactured under the most favorable conditions in a plant recently equipped at large expense for this particular purpose. They represent the greatest value for price charged.

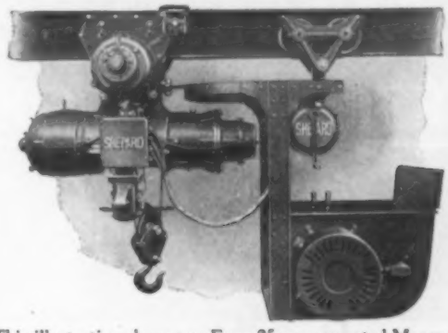


The Case Crane & Engineering Co.

Electric Overhead Traveling Cranes

COLUMBUS, OHIO

For Speedy Operation



This illustration shows our Form 25 cage operated Monorail Hoist. It is specially designed so that the operator can travel with the load.

Gearing is fully enclosed in heavy grey iron cases. All brakes are oil-bath lubricated from reservoirs of ample capacity. Trolley is equipped with electric brake which brings the machine quickly to rest as soon as the current is cut off from the trolley motor. The cage is hung from a trailer trolley, the only function of which is to support the cage.

Ask us to send you our Shepard Folder S.

SHEPARD
ELECTRIC CRANE & HOIST CO.
NEW YORK, PHILADELPHIA MONTOUR FALLS N.Y. PITTSBURG CHICAGO
BOSTON, BALTIMORE, BIRMINGHAM, SAN FRANCISCO, MONTREAL, MELBOURNE-AUSTRL. LONDON.

THE SHAW ELECTRIC CRANE COMPANY

WORKS MUSKEGON, MICHIGAN

SALES OFFICES IN ALL PRINCIPAL CITIES

MANNING, MAXWELL AND MOORE, INC.

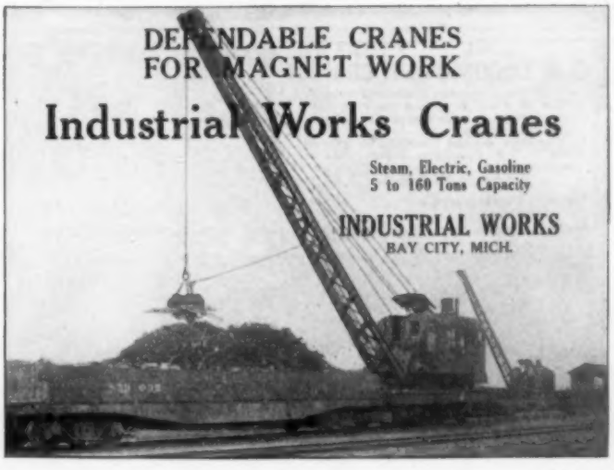
PRINCIPAL OFFICE - 119 WEST 40TH. ST., NEW YORK.

DEPENDABLE CRANES
FOR MAGNET WORK

Industrial Works Cranes

Steam, Electric, Gasoline
5 to 160 Tons Capacity

INDUSTRIAL WORKS
BAY CITY, MICH.

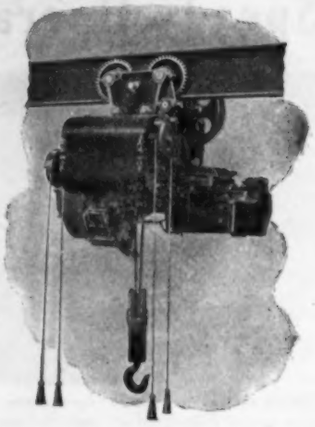


NORTHERN CRANES

ELECTRIC and HAND TRAVELING CRANES
ELECTRIC and AIR HOISTS and TROLLEYS

NORTHERN ENGINEERING WORKS.
DETROIT, MICH. U.S.A.

Canadian Works—Northern Crane Wks., Ltd., Walkerville, Ont.



Heavy, light or medium sized jobs are easy to handle with a "P & H" Hoist.

Save the wages of from six to ten men by installing a Type "U".

Capacities:—½ to 6 Tons.

Ask for information and for copy of Bulletin 301-B

PAWLING & HARNISCHFEGER CO.
Milwaukee, Wis.

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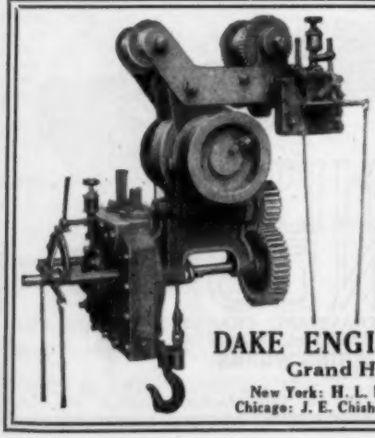

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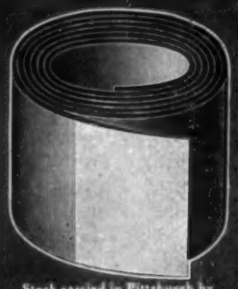

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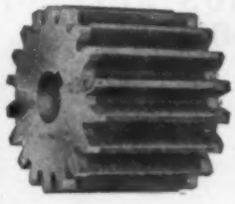

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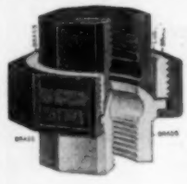

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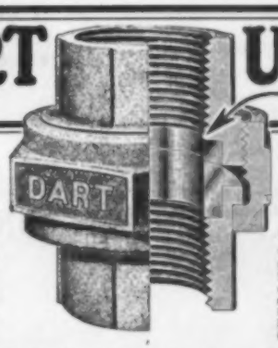

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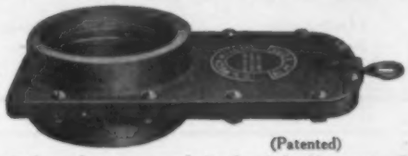

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Gas Producers, Furnace Reversing Valves 21" to 36"
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THE STEEL IMPROVEMENT & FORGE COMPANY
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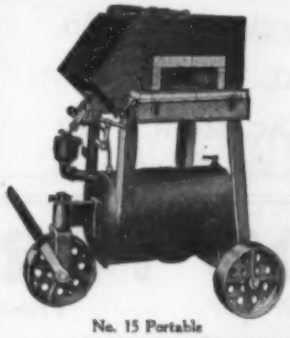

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OIL-FUEL RIVET FORGES

Insure against scaly, imperfectly heated and burned rivets.

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LAKE SUPERIOR
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916 H. W. Oliver Bldg. PITTSBURGH, PA.
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Makers of
LOW PHOSPHOROUS :: PIG IRON
FREE FROM COPPER AND ARSENIC
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50% FERRO-SILICON

Prompt Shipments
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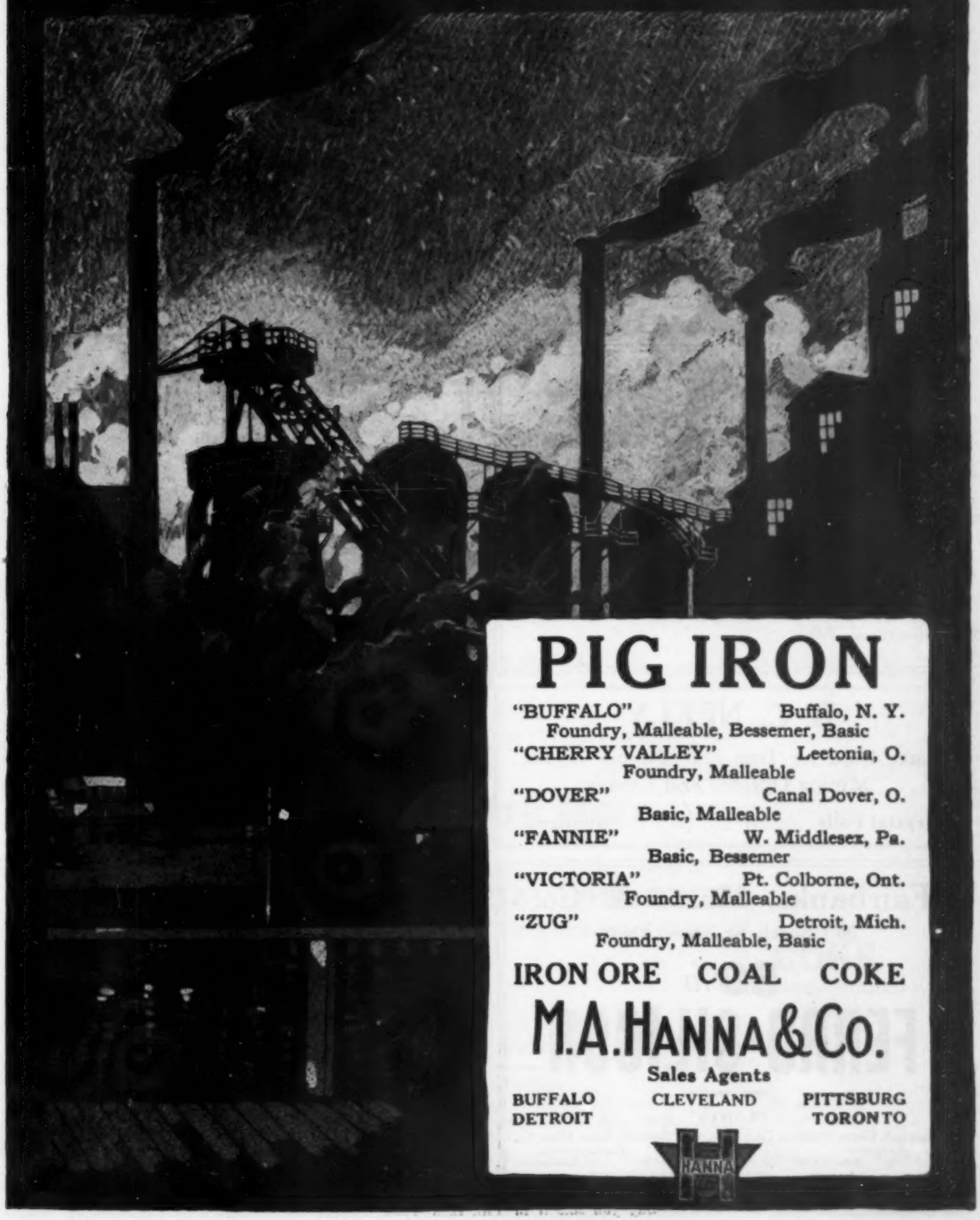
HANNA



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THE MERRITT DEVELOPMENT COMPANY and THE CUYUNA MINNEAPOLIS IRON COMPANY have large ore bodies and are also large producers of high grade manganiferous iron ores. The ores are high in metallic contents, low in phosphorous, and low in silica. Properties situated section 33 and 23, Township 47, Range 29, Crow Wing County, Minnesota on Cuyuna Range. If interested, address all communications to Franklyn W. Merritt, president and manager both companies, 514 Plymouth Bldg., Minneapolis, Minn.

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is now producing
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BASIC PIG IRON
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Furnaces at Struthers, Ohio
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A NATION WIDE
Distribution is at your service when you use

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Rails, Blooms, Billets, Slabs, Bars
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TENNESSEE SPECIAL TOOL STEEL

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Results Count—Boronic (all-metal) Alloys Give Them

The statements we make about Boronic (All-Metal) Products—put up in shot form—are not mere claims—they are facts proved by large repeat orders from some of the largest manufacturers in the country.

If you are operating any kind of a foundry you shouldn't be without Boronic (All-Metal) Products—they purify, strengthen and increase the machining qualities of all metals.

Tell us what you are melting and we will send you a small trial lot at the Ton price, carriage charges prepaid. Get our Catalog—it will surprise you to learn what we are doing.

References requested to our two page advertisements in the September 20, October 4 and November 1 issues of *The Iron Trade Review.*

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Best Grade Carbon Electrodes

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NICKELOY
The best Aluminum-Nickel Casting Alloy on the market, hard and tough, easily fusible—not attacked by oxidizing agents.

This Alloy machines beautifully and solders easily.

For light, strong Castings of the highest quality.

Write for prices

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The object of this Company is to assist manufacturers in disposing of their excess or obsolete materials, especially Steel and Steel Products.

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Works at SHARON and UNIONTOWN, PENNA.

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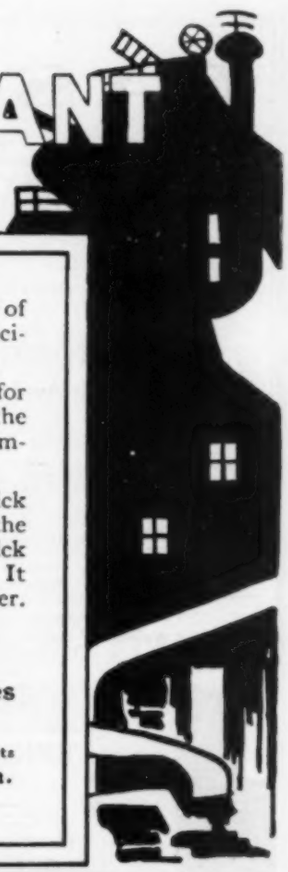

Behind the success of every furnace lies efficiency.

Efficient material for the construction of the furnace itself is most important.

Adamant Fire Brick Cement will increase the life of your Fire Brick from 100 to 500%. It welds the brick together.

Write for samples.

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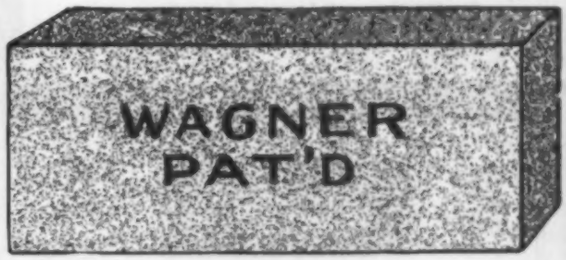

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Prompt Deliveries

Samples and Quotations on Request

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FERROALLOYS METALS AND ORES

FOUNDED 1869 BY GEO. G. BLACKWELL

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FREE FROM CARBON

GEO. G. BLACKWELL, SONS & CO., LIMITED
THE ALBANY, LIVERPOOL, ENG.
Manufacturers, Metallurgists, Mine Owners, Merchants

WORKS: Garston Docks. CODES: A. B. C., Moreing and Neal, Lieber's and Western Union.

ALLOYS OF COPPER WITH THE RARE METALS

We make any and EVERY ALLOY AND METAL REQUIRED
We make a SPECIAL HIGH SPEED ALLOY FOR TOOL STEEL

BESSEMER FERRO-SILICONS THE GLOBE IRON COMPANY JACKSON OHIO JACKSON COUNTY SILVERIES SPECIAL HIGH SILICON GRADES

GLOBE

OLD COMPANY
MODERN PLANT
BEST FACILITIES
BEST ORGANIZATION
HIGHEST IN SILICON
MOST UNIFORM IN QUALITY
BEST SERVICE
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The Brick of True Efficiency

New Jersey Fire Clay Brick

are celebrated for their efficiency and economy. They are made from the best grades of New Jersey Fire Clay.

Write us.

Mutton Hollow Fire Brick Company
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Fire Brick; Cupola Linings; Boiler Arches and Special Fire Clay Products; Foundry Clays; Kaolin and Sands; Ground Fire Clays.

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Established 1845
Manufacturers of
HIGH GRADE FIRE CLAY AND SILICA BRICK

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Established 1872 Incorporated 1904

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Manufacturers of High Grade Ground Fire Clay and Clay Fire Brick for Regenerator and Heating Furnaces, Boiler Settings and Arches, Stacks, Flues, By-Product, Rectangular and Bee Hive Coke Ovens.

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High Grade Silica, Magnesia and Chrome Brick
Dead Burned Magnesite
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THE BEST FOR THE HARDEST SERVICE
ESPECIALLY ADAPTED FOR
Blast Furnace Tops; Hot Blast Stoves; Boiler Settings; Soaking Pits; Heating Furnaces; Cupola Linings; Gas Producers; Carburetors and Washers. Will not spall, crack or swell.
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Coal Coke

From our own and affiliated ovens and mines

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MANUFACTURERS OF
High Grade Silica, Chrome, Magnesia and Fire Clay Brick
IMPORTERS OF
Chrome Ore and Spaeter Dead Burned Magnesite
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POWDERED COAL
Prepared, Distributed and Burned by
THE QUIGLEY METHOD
is backed by the Quigley Organization of experienced Fuel and Furnace Engineers. We make reports, design, construct and operate complete plants for preparing, distributing and burning powdered coal.
Quigley Furnace Specialties Co., 26 Cortlandt Street New York

The MODERN WAY of handling ASHES is by the

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Members of the Wholesale Coal Trade Assn. of New York and members of the National Coal Jobbers' Assn.

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Pulverized Coal?

Do you know why Pulverized Coal is the most efficient and most economical fuel to use? See our advertisement in the Dec. 6 issue of THE IRON TRADE REVIEW.

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"PYRO-STEEL"
for HIGH HEAT WORK
Made from the Famous Sciotoville Clays
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FOUNDRY IRONS
BASIC PRODUCTS COMPANY
DEAD BURNED DOLOMITE
"SYNDOLAG"
Service that accommodates

Fire Brick

Standard 9" and Special Shapes

Our XX mixture of Woodbridge N. J. fire clays is highly refractory and equal to the best in the market.

Unusual facilities for the manufacture of difficult shapes.

Special shapes guaranteed straight and free from cracks.

The service of our Drafting Department free of charge.

FEDERAL TERRA COTTA CO.
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FRANK B. POPE COMPANY
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FIRE BRICK—LADLE BRICK—FIRE CLAY
SALES OFFICE—1403 Arrott Building Phone Court 3434
Buy a Car of Our Standard Dry Press "LADLE BRICK"
They Will Please You
Works—Beech Creek, Pa., Sligo, Pa., Freeport, Pa. and Mayport, Pa.

UNION MINING CO.
MT. SAVAGE, MD.
Proprietors of the
Mt. Savage Fire Brick Works
(SUCCESSFULLY OPERATED FOR 70 YEARS.)
Manufacturers of
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Mt. Savage, Md.
1113-1117 Fidelity Bldg. Baltimore, Md.
Oliver Bldg. Pittsburgh, Pa.
50 East 42nd St. New York, N. Y.

Jos. Soisson Fire Brick Co.
CONNELLSVILLE, PA.

SIL-O-CEL
PREVENTS HEAT PENETRATION
TRADE MARK
MADE FROM CELITE
The most effective Heat Insulation for Hot Blast Stoves, Hot Blast Mains, Annealing Furnaces, etc.
Convenient Forms: Brick, Blocks, Powder, Cement.
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PITTSBURGH Oliver Bldg.
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SAN FRANCISCO Monadnock Bldg.
Write nearest Office for Samples and Information

CYANIDE HARDENING COMPOUND
Why not try it?
A good substitute for Cyanide at a much lower price.
PARK CHEMICAL COMPANY
DETROIT - - - MICHIGAN

THE "CLEARFIELD" FIRE BRICK
MANUFACTURED BY
THE CLEARFIELD FIRE BRICK CO.
Office and Works at CLEARFIELD, PA.

Employment

POSITIONS OFFERED

Minimum ad. set solid, 50 words $1.00
Minimum ad. all caps, 50 words $1.50
(Each additional word set solid, 2c.—Each additional word all caps, 3c.)

POSITIONS WANTED

Minimum ad. set solid, 25 words $.50
Minimum ad. all caps, 25 words $.75

Positions Offered

WANTED: — DRAFTSMAN, FAMILIAR with steel works construction. State experience and salary wanted. Address C. F. & I. Company, manager, Minnequa Works, Pueblo, Colo.

STEEL MELTER, WITH EXPERIENCE ON ELECTRIC OR OPEN HEARTH FURNACES FOR POSITION WITH NEW ELECTRIC STEEL CASTING PLANT IN MINNEAPOLIS DISTRICT. EXPERIENCE IN ELECTRIC STEEL CASTING PLANT DESIRABLE. EXCELLENT OPPORTUNITY. WRITE FULLY, GIVING FULL EXPERIENCE, REFERENCES AND SALARY EXPECTED IN FIRST LETTER. MINNEAPOLIS STEEL AND MACHINERY CO., MINNEAPOLIS, MINN.

SUPERINTENDENTS AND WORKS Managers—seven good men; $4000 to $10,000 per year.
Efficiency and Production Engineers—three.
Engineers and Draftsmen of all kinds; Chemists—six; Iron and Steel, etc.
H. H. Harrison & Company, Association Bldg., Chicago, Ill.

FOUNDRY FOREMAN, WITH PROVEN ABILITY FOR MAKING LIGHT AND MEDIUM STEEL CASTINGS, FOR POSITION WITH NEW ELECTRIC STEEL CASTING PLANT IN MINNEAPOLIS DISTRICT. THOROUGH KNOWLEDGE OF STEEL MOLDING AND ABILITY TO PRODUCE GOOD CASTINGS IN QUANTITY ESSENTIAL. WRITE FULLY, GIVING FULL EXPERIENCE, REFERENCES AND SALARY EXPECTED IN FIRST LETTER. MINNEAPOLIS STEEL AND MACHINERY CO., MINNEAPOLIS, MINN.

THE BEST WAY TO GET A GOOD position in drafting or engineering is to file an application direct with some of our clients who are depending on us to get competent and experienced applicants for their vacant positions. Send stamp for blank and list of vacant positions. The Cleveland Engineering Agency Co., Rose building, Cleveland, O.

WANTED: — MAN TO TAKE CHARGE of electric melting department of important tool steel works. Only high grade men, with practical metallurgical experience, need apply. Forward full particulars of experience, training, salary desired, etc. Address Box 222, THE IRON TRADE REVIEW, Cleveland, O.

WANTED:—A THOROUGHLY COMPE- tent tool designer to design tools, jigs and fixtures for a concern doing a job stamping business. Must also be able to estimate cost of dies. Splendid opportunity for the right man. In replying, state full particulars of past and present employment. Address Box 225, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: — PATTERN MAKER CAP- able of acting as Assistant Superintendent, of shop employing 30 men. Must be first class metal pattern maker. State age and experience in first letter. Address Box 162, THE IRON TRADE REVIEW, Cleveland, O.

BLAST FURNACE OPERATOR FOR plant in South Africa. Give salary and full particulars regarding experience in the first letter. Applicant must be above military age and no slacker need apply. McLain's System, Goldsmith Building, Milwaukee, Wis.

Positions Offered

WANTED: — CHEMIST FOR TESTING steel. State experience nationality and terms. Address Box 212, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: — FIRST CLASS PATTERN foreman for shop of 60 men. Must be able to handle wood, metal and machine plates. State age, experience, reference and salary. Will arrange interview. All applications treated strictly confidential. Address Box 161, THE IRON TRADE REVIEW, Cleveland, O.

WANTED

EXPERIENCED WIRE MILL

MANAGER OR SUPERINTENDENT FOR PLANT HAVING A CAPACITY OF 3000 TO 5000 TONS OF WIRE PER MONTH. THIS IS AN INDEPENDENT PLANT. ALL COMMUNICATIONS CONFIDENTIAL. WILL PAY SALARY AND PERCENTAGE OF PROFITS. ADDRESS BOX 191, THE IRON TRADE REVIEW, CLEVELAND, O.

WANTED: — SUPERINTENDENT FOR sheet metal department in a north eastern Ohio factory. We want a man who is up to date in costs, laying out work and handling men; one who can suggest articles to manufacture and get them started. State age, experience, salary expected and date available. Address Box 160, THE IRON TRADE REVIEW, Cleveland, O.

Positions Wanted

POSITION AS EXECUTIVE OR AS- sistant. Have had 20 years experience as purchasing agent in sales department of large steel company with subsidiary companies. Am conscientious, thoroughly reliable and willing to consider any reasonable proposition. Address Box 220, THE IRON TRADE REVIEW, Cleveland, O.

SALESMAN WANTED; POSITION AS SALESMAN I CAN SELL AND DEMONSTRATE ANYTHING USED IN A FOUNDRY QUALIFIED TO MEET ANY CONDITION REQUIRING ABILITY AND FORESIGHT. SALARY AND COMMISSION PREFERRED. ADDRESS BOX 227, THE IRON TRADE REVIEW, CLEVELAND, O.

MALLEABLE FOUNDRY SUPERIN- tendent wants an opportunity to handle a big proposition in a big way. Just completed building up-to-date Malleable Foundry but desire to be interested financially and become a permanent associate where I can increase in capacity and responsibility. Would be glad to give further unrestricted information; personal interview preferred. Address Box 219, THE IRON TRADE REVIEW, Cleveland, O.

Positions Wanted

PURCHASING AGENT, OFFICE MANA- ger or secretary, having ability and experience in Steel, Machinery and Foundry business, Pittsburg territory preferred, but will consider any location. High grade man and best of references furnished. Address Box 210, THE IRON TRADE REVIEW, Cleveland.

ACTIVE, HUSTLING REPRESENT- ative in Pittsburg district would like to handle output of some reputable manufacturer of, steel products, factory supplies, brass or special line. Have large personal acquaintance and the necessary experience. Correspondence solicited. Address Box 211, THE IRON TRADE REVIEW, Cleveland, O.

PORCELAIN ENAMELING. A MAN OF WIDE EXPERIENCE WANTS A JOB TO BUILD OR OPERATE A PLANT. ADDRESS BOX 497, THE IRON TRADE REVIEW, CLEVELAND, O.

WHEN YOU NEED A HIGH GRADE executive, engineer, draftsman, or any technical man, consult The Engineering Agency, Inc., (Est. 24 years), 1662 Monadnock Block, Chicago.

PRACTICAL FOUNDRY SUPERIN- TENDENT, 37; EXPERT ON MARINE ENGINE CASTINGS; FIRST-CLASS REFERENCES. ADDRESS BOX 228, THE IRON TRADE REVIEW, CLEVELAND, O.

MECHANICAL ENGINEER WITH 8 years experience in pipe manufacturer and furnace work. Available after Jan. 15, 1918. Age 35 and married. Address Box 216, THE IRON TRADE REVIEW, Cleveland, O.

I HAVE 22 YEARS PRACTICAL EXPE- rience blowing and general foreman. Present salary $225.00 per month. Good reasons for change. References from past and present employers. Address Box 221, THE IRON TRADE REVIEW, Cleveland, O.

PRACTICAL FOUNDRYMAN, EXPERT ON CUPOLA PRACTICE, WOULD LIKE POSITION WITH COKE AND IRON CO., AS SALESMAN AND DEMONSTRATOR. ADDRESS BOX 229, THE IRON TRADE REVIEW, CLEVELAND, O.

WANTED:—POSITION SUPERINTEND- ent of Steel Foundry. Have 15 years experience Basic, Acid, Open Hearth and Electric Steel Castings. Experienced on high speed and other steel alloys. At present employed. Want change Jan. 1. Two years experience shell castings. Age 37. Excellent health. Address Box 199, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: — POSITION AS MASTER mechanic. Have more than 10 years experience as Master Mechanic in Rolling Mill, Blast Furnace and Steel Plant work. At present employed, but desire a change. Am a practical mechanic and thoroughly familiar with the above line of work and management of help. Address Box 173, THE IRON TRADE REVIEW, Cleveland, O.

WANTED:—POSITION BY AN EXPE- rienced chemist; blast furnace or steel. Address Box 197, THE IRON TRADE REVIEW, Cleveland, O.

CIVIL ENGINEER 30; MARRIED; 10 years experience in drafting, designing, field work, desires position as construction engineer with large Industrial Concern or one of similar nature. Address Box 214, THE IRON TRADE REVIEW, 2149 Oliver Bldg., Pittsburg, Pa.

Opportunities

Agencies Wanted and Offered | **Investment of Capital** | **Plants for Sale Lease or Purchase**

ADVERTISING RATES: 1" One Time $2.50; 2" One Time $4.75; 3" One Time $6.75; 4" One Time $8.25
RATES FOR LARGER SPACE OR LONGER PERIODS FURNISHED ON REQUEST

TANKS For Sale

Quick delivery, reasonable price.

12 steel plate tanks 20' 0" long, 9' 9" wide, 4' 6" deep, metal ⅜". These tanks have never been used and can be shipped "knocked down" or riveted up.

Tippett & Wood
Phillipsburg, N. J.

WE BUY FOR CASH

ANY SURPLUS STOCK OF

Bar Iron
Bar Steel
Structural Material
Plates, Sheets, Etc.
Good Second Hand Iron and Steel

Send itemized lists with full description and prices

AMIRON SUPPLY CO., Inc.
137th St. and Lincoln Ave. New York

OPEN HEARTH Steel Furnace

1—5 ton Open Hearth Tilting Steel Furnace made by the Wellman, Seaver, Morgan Company, all complete with a 100 ft. stack, and the necessary equipment, all for use in steel foundries.

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COAL

Mining Company recently incorporated in Penn'a, by experienced coal men owning 200 acres, six foot E seam Low Volatile, Low Sulphur Smithing and By-Product Coking Coal and High grade, Low Ash, Semi-smokeless steam, export or bunker coal on P. R. R. with Clearfield rate east, to finance development, offers participation to large consumers of coal.

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"LIBERTY" CLINCH RINGS

SPECIAL DESIGN—Made from special material

GUARANTEED UNBREAKABLE

All sizes

Plain and Galvanized

LIBERTY STEEL PRODUCTS COMPANY, Inc.

Woolworth Building NEW YORK

Telephones 5054—5056 Barclay

Industries Wanted

Carlisle, Pennsylvania, on the Philadelphia & Reading and Cumberland Valley (branch of the Pennsylvania System) railroads, offers unexcelled facilities as a manufacturing and distributing location. An abundant supply of labor at reasonable wages available; electric power as low as 1.7c per K. W. H.; adequate homes for workingmen from $8.00 to $12.00 per month; educational and recreational facilities beyond the average city of 12,000; free sites and liberal banking accommodations offered. Write Chamber of Commerce.

FOR SALE

Iron Plates ¼ to ⅜.
Steel Plates.
Steel Sketch Plates.
Structural Shapes.
Other Materials.
Tanks and Tank Cars.

SHIPPERS' CAR LINE
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PLATES—For Sale

Shipment From Stock

1500 Tons

⅛" to 1¼" thick O. H. Soft Steel Sheared and U. M.
also
Beams—Channels—Angles
and
Concrete Reinforcing Bars
Send for List

The Republic Structural Iron Works Co.
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WIRE ROPE ⅜" to 2"

Hoisting, haulage, Cableway. Tramway, and equipment for one mile. Galv. Guy Rope. Bought. Sold. Bridle and sling chain. Stone dogs (heavy). Steel and wood blocks.

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Unusual opportunity now to secure permanent co-operation of large user of Galvanized and Black Sheets, location middle West, working day and night on Patented Products—Control and assurance of ample supply necessary for opportune expansion.

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ISSUE A WEEKLY LIST OF SURPLUS STOCKS AND OF DISCONTINUED SIZES OF METALS.

TIN PLATE AND SHEET METALS A SPECIALTY.

DROP US A POSTAL IF YOU WANT US TO ADD YOUR NAME TO OUR MAILING LIST.

We shall be pleased to include any surplus stock you may have, without charge, unless we make sale.

Foundry and Machine Shop For Sale

Well equipped foundry and machine shop, now in operation at Billings, Montana. Large exclusive territory in farming, mining, gas and oil section. Good railroad facilities and splendid home market.

Address P. O. Box 1018
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Open Hearth Forging Ingots For Sale

For prompt delivery

Chilled or Sand Cast
Acid or Basic
Plain or Alloy Steel

Let us have your inquiries.

Edgewater Steel Company
Box 249
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For Sale
Amiron Supply Co., Inc.
2490 3rd Ave., Bronx, N. Y.
On Hand for Immediate Shipment

5 Tons 3 x ⅛ S.S. Bars 16/20'.
12 Tons 3 x ¾ S.S. Bars.
12 Tons 3½ x ⅝ S.S. Bars.
30 Tons 1 x 1 x ⅛ Angles x 25'.
25 Tons 1½ x 1½ x ¼ Angles x 28'.
15 Tons 4" Beams, 7½ lbs., 4' to 7' 8".
150 Tons 4" Beams, 7½ lbs., 40'.
30 Tons 6" Beams, 12¼ lbs., 40'.
10 Tons 8" Beth. Girders, 32½ lbs., 40'.
10 Tons 9" Beams, 21 lbs., 40'.
30 Tons 9" Beams, x 10'.
10 Tons 15' Beams, 42 lbs., 40'.
5 Tons 4" Channels 5¼ x 35'.
5 Tons 4" Channels 6¼ x 35'.
80 Tons 4" Channels 7¼ x 12'.
5 Tons 4" Channels 7¼ x 35'.
20 Tons 9 x ½ and 10 x ½ Plates.
40 Tons ¼ Plates 5' x 12'.
10 Tons No. 15 B. A. Sheets 28 x 96.
50 Tons C. D. Screw Stock ⅛" to 2½" round.

Also other sizes of Iron and Steel Material.

Amiron Supply Co., Inc.
2490 3rd Avenue Bronx, N. Y.

FOR SALE
Factory Building with Frontage on Penna Railroad Main Line at Canton, Ohio.

Will be sold at a bargain. Main building two story brick, with one story Wing suitable for small foundry or blacksmith shop. About one acre of ground. More land obtainable at a reasonable figure. This plant is especially adapted for machine shop, general manufacturing or storage. Formerly occupied by The H. L. Hurst Mfg. Co.

Apply to any real estate dealer in Canton or address

J. Z. LAMIELL,
1014 Bluff Rd., N.E. Canton, O.

FOR SALE
Cold Rolled Strip Steel in coils and flats

.050x2½—10 ft. lgths. Hd. 11,000 lbs.
.060x2⅞—coils, Hf. Hd. 13,000 lbs.
.062x2¼—5 ft. lgths. Qu. Hd. 13,000 lbs.
.070x3⅛—6 ft. lgths. Qu. Hd. 17,000 lbs.

The above at 6c per lb., f.o.b. New York.

13-32 round Screw Stock—10,000 lbs., at 5c per lb., f.o.b. New York. All this material is offered subject to prior sale.

MIDGLEY & PRENTICE, Inc.
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FOR SALE
STEEL BUILDING
70' x 145'
30' to eaves

No. 20 ga. corrugated gal. roofing.
No. 22 ga. corrugated gal. siding.
Good condition.

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Suppose you were informed of a manufacturer who is looking for a site on which to build a plant which would employ a THOUSAND MEN who would build their homes in your city—buy from your merchants, deposit money in your banks and in general greatly increase the prosperity of your community—

Would you pass it by—WOULD YOU ? ?

Each week there are numerous manufacturers who would be interested in the sites of YOUR COMMUNITY if they knew what excellent facilities you have to offer. An advertisement in this department will let them know what you can offer.

Tell Them NOW!

Second Hand Machinery

Used Equipment of Metal-Working Plants

ADVERTISING RATES 1" One Time $2.50 3" One Time $6.75
2" One Time $4.75 4" One Time $8.25

RATES FOR LARGER SPACE OR LONGER PERIODS FURNISHED ON REQUEST

1876 THE MACHINERY HOUSE OF THE EAST 1917

FRANK TOOMEY, Inc.

Lathes

13" x 5' 6" New Carroll-Jamieson.
14" x 6' Reed.
14" x 10' Prentiss T.A.
15" x 8' New Carroll-Jamieson, quick change.
15" x 6' New Sidney, D.B.G., quick change, swing 17".
16" x 6' Reed.
16" x 6' Hamilton, turret on bed.
14—17" x 8' New National Q.C.G.
17" x 8' New Sidney, D.B.G., quick change, swing 19".
18" x 8' Springfield.
19" x 8' New Sidney, D.B.G., quick change, swing 21".
20" x 10' Blaisdell.
22" x 20' Reed, blocked to 29".
24" x 10' New Carroll-Jamieson.
32" x 16' Draper Triple Geared.
32" x 24' Fay & Scott blocked to 53".

Turret Lathes

2—3" x 36" Jones & Lamson.
24" Gisholt, motor driven.
2" Cleveland, automatic.
1¼" Cleveland, automatic.
⅞" Cleveland, automatic.

Planers

36" x 36" x 8' Pond, two heads.
30" x 30" x 10' Bement, two heads.
24" x 24" x 6' Gray.

Shapers

3—14" New Steptoe.
16" American.
15" Bement traveling head.
2—20" B.G. Steptoe New.

Millers

No. 3 New Kempsmith Universal.
No. 3 New Kempsmith Plain.
2—No. 2 New Kempsmith, Universal.
No. 1 New Kempsmith, Universal.
No. 0 New Steptoe, B.G., P.F.
5—Steptoe New hand Millers.
Beaman & Smith vertical Miller, table 24" x 6'.

Grinders

No. 2 New Grand Rapids Universal Cutter Drill and Tool Grinder.
8" x 20" Landis Plain.
10" x 20" Bath Universal.

Punches and Shears

24" Throat single end geared shear, 15" blade.
18" Throat Industrial double end geared Punch.
9" Throat geared Punch.

Presses

No. 5 Niagara Arch Press.
No. 26 Niagara Inclinable Press.
No. 126A New Max Ams Inclinable.
No. 138 New Max Ams Inclinable.
30-Ton Watson Stillman Broaching Press.

Drills

13" Four spindle Sensitive Drill.
14" New Excelsior Sensitive.
15" New Demco roller bearing bushed.
16" New Kokomo hu-speed, roller bearing bushed.
2—20" New Superior, W. & L.
2—20" New Canedy-Otto, B.G., P.F.
3—25" New Superior, sliding head.
24" New Superior, sliding head, tapping attachment.
28" New Superior, sliding head.
32" New Superior, sliding head.
36" New Superior, sliding head.
D-4 Colburn high duty Drills.
3—20" Rockford high duty Drills.

Hammers

2000 lb. Niles Double Frame Steam.
250 lb. New Little Giant, belt.
125 lb. Scranton Belt.
100 lb. New Little Giant, belt.
50 lb. New Little Giant, belt.
25 lb. New Little Giant, belt.

Pipe and Bolt Machines

No. 734 New Wills Bolt Threading.
2" Saunders Pipe Machine.
4" Saunders Pipe Machine.
No. 304A New Oster Pipe Machine.
8" Saunders Pipe Machine.

Miscellaneous

16" x 10' Automatic Threading Lathe.
4—8" Dwight Automatic Gear Cutter.
2—Garvin Profilers.
Pratt & Whitney Cutting Off Machine, 2⅝" hollow spindle.

FRANK TOOMEY, Inc.

127-129-131 North 3rd Street Philadelphia, Pa.

WE MAINTAIN OUR REPUTATION

MODERN TOOLS : LOWEST PRICES : HONEST METHODS

LATHES

Rivett Precision Screw Cutting Lathe.
1—16 x 6′ Lodge & Shipley, quick change gear, taper attachment, with chuck.
2—18 x 8′ American quick change gear, complete with chuck.
1—18 x 8′ Lodge & Shipley quick change gear, complete with chuck.
1—18 x 10′ Hendey, quick change gear, yoke head, complete with chuck.
1—24 x 12′ American quick change gear with chuck.
1—28 x 12′ Pond quick change gear, heavy duty, massive pattern.
1—30 x 16′ Lodge & Shipley, quick change gear, with chuck.
1—30 x 14′ Blaisdell compound rest, complete with chuck.
1—30 x 14′ Lodge & Shipley, quick change gear with chuck.
1—54 x 24′ Putnam, compound rest, PCF, complete with chuck.

MILLERS

2—No. 25 Ohio Universal heavy duty, brand new.
1—No. 2 Rockford Universal, heavy duty, brand new, single pulley drive.
1—No. 2-C Rockford Universal, brand new.
1—No. 2 Cincinnati Universal brand new.
1—No. 2 Hendey Universal, used, complete.
1—No. 2 Cincinnati Universal, used, complete.
1—20 x 7 x 17 Oesterlein Universal Complete, good as new.

SHAPERS

1—16″ brand new Milwaukee, back geared.
1—20″ Ditto.
1—16″ Smith & Mills, back geared.
1—16″ Kelley, back geared.
2—25″ Smith & Mills, heavy duty, back geared, single pulley drive.

BORING MILLS

2—30″ Bullard Vertical with turret head.
1—36″ Gisholt Vertical with one head, good as new.
1—London Machine Co. 6″ bar, horizontal, 90″ swing.
1—Newton duplex horizontal.

GREETINGS NINETEEN EIGHTEEN

GRINDERS

2—No. 190 Wells Cutter and Reamer, brand new.
1—No. 1 Cincinnati Tool and Cutter.
1—No. 3 Brown & Sharpe Cutter and Reamer.
1—No. 1 Wilmarth & Marmon Universal, brand new.
1—No. 2 Norton Universal.
1—No. 13 Brown & Sharpe Universal.
1—No. 3 Wilmarth & Marmon Universal.
1—16″ x 60″ Cincinnati practically new, Crank Shaft.
1—No. 5 Bath duplex Internal and External, Cylinder.
1—No. 75 Heald Internal Grinder.

BOLT CUTTERS AND PIPE MACHINES

2—2″ Acme complete with all dies.
1—No. 11 Jericki Pipe Machine complete with dies.
1—8″ Williams Pipe Machine, complete with dies.

AUTOMATIC SCREW MACHINES

4—No. 52 National Acme, 4 spindle single pulley drive.
1—No. 53 National Acme, 4 spindle, single pulley drive.
1—No. 55 National Acme, 4 spindle, single pulley drive.
1—No. 515 National Acme, 4 spindle, single pulley drive.

PLANERS

1—24 x 24 x 6′ Pond, heavy duty, single head.
1—29 x 29 x 6′ New Haven, with 2 heads, double belt drive.
1—30 x 30 x 8′ Harrington, single head.
1—36 x 36 x 12′ Pease single head.

RADIAL DRILLS

1—2½ ft. Gang plain.
1—4 ft. Mueller, heavy duty, plain, single pulley drive.

MISCELLANEOUS

1—350 lb. American single frame Steam Hammer.
1—No. 4 Long & Alstatter plain Slitting Shear.
1—No. 4 Williams & White Bulldozer.
1—30 x 7′ Gould & Eberhardt Spur Gear Cutter.
1—No. 2 Royersford double end Punch and Shear.
1—No. 3-A Royersford double end Punch and Shear.

We will accept 25% Liberty Bond with Any Order

MODERN MACHINERY EXCHANGE

52-54 Walker Street, NEW YORK. N. Y.

NEW YORK'S GREATEST STOCK

(PARTIAL LIST)

RADIAL DRILLS

6′ Pond Plain.
5′ Prentice Plain.
4½′ Niles Semi-Universal.
3½′ Prentice Plain, tapping attachment.
3½′ Hilbert Plain, tapping attachment.
3½′ Prentice Bros. Plain.
3′ Fosdick Plain.

PLANERS—SHAPERS

60″ x 60″ x 28′ Betts Planer, two heads.
55″ x 46″ x 14′ Lincoln Stone Planer, four heads.
42″ x 42″ x 14′ FLATHER PLANER, THREE HEADS.
38″ x 38″ x 10′ NILES PLANER, TWO HEADS.
32″ x 32″ x 10′ New Haven Planer.
30″ x 30″ x 8′ Pease Planer, two heads.
30″ x 30″ x 8′ New Haven Planer.
SEVERAL NEW 24″ HOLLINGWORTH IMPROVED TRIPLE GEARED CRANK SHAPERS.
24″ Cincinnati two head Traveling Shaper.
17″ x 42″ Warren Traveling Head Geared Shaper.
10″ x 42″ Traveling Head Shaper.
26″ Lodge-Davis Geared Shaper.
24″ Steptoe Geared Shaper.

BORING MILLS

42″ BULLARD VERTICAL, two heads.
36″ McCabe Vertical.
Four 30″ Bullard Vertical.
20″ Bullard Vertical Turret Lathe, side and turret heads.
18″ Bullard Vertical Turret Lathe, side and turret heads.
No. 2 Barrett Horizontal Cylinder, 5″ bar.
Betts Horizontal, 2¼″ bar.
40″ Putnam Car Wheel.
Niles Car Wheel, table 48″ diameter.

MILLING MACHINES

36″ x 36″ x 12′ INGERSOLL HEAVY DUTY HORIZONTAL SLAB, ADJUSTABLE RAIL.
Ingersoll Slab, 23″ between housings.
Becker-Brainard Slab, table 22″ x 10′.
Beaman & Smith two spindle Vertical Slab, table 24″x48″
No. 33 Becker-Brainard Slab, table 9½″ x 22″.
No. 4 Garvin Full Universal, Dividing head, vertical attachment.
No. 3 Cincinnati Plain.
No. 2 Cincinnati Plain.
New No. 1½ American Plain.
No. 1 Bickford Plain.
No. 13 Garvin Plain.
No. 4 Garvin Profiler.
Two No. 1 Garvin two spindle Profilers.

LATHES

96″ x 20′ Pond Turning and Boring Lathe, face plate drive, compound rest, power cross feed. 9′ 6″ between centers.
Two 48″ x 6′ 6″ Bull Lathes, face plate drive.
36″ x 18′ Farrel, face plate drive, 12′ centers.
NEW 35″ x 12′ Houston, Stanwood and Gamble, double back geared.
24″ x 24′ Fitchburg, raising blocks to 30″, 19′ centers.
24″ x 12′ Bradford, quick change gear, 2″ hollow spindle, taper attachment.
24″ x 10′ American, taper attachment.
24″ x 8′ American, taper attachment.
Three 21″ x 8′ Hamilton, double back geared, 2″ hollow spindle.
20″ x 9′ American, taper attachment, 2″ hollow spindle.
Two NEW 18″ x 8′ Hollingworth, quick change gear.

PUNCHES and SHEARS

Queen City Punch, 12″ throat, punch ⅜″ thru ¾″, architectural jaw.
Columbus single end Punch, 24″ throat, punch ¾″ in ¾″.
Newell Direct Acting Gap Punch, 53″ throat, punch ½″ thru ⅝″
No. 3A Royersford double end Punch and Shear, 10″ throats, punch 1″ in ⅞″.
No. 1 Royersford double end Punch and Shear, 7″ throats, punch ⅞″ in ⅝″.
Pels Beam Shear "T-40"; weight 9150 lbs.
Ridgeway & Sons Alligator Shear, 15″ blades.
Several NEW HAND POWER PUNCHES and SHEARS.

HAMMERS

1600 lb. Bement single leg Steam.
1500 lb. Billings & Spencer Board Drop.
800 lb. Pratt & Whitney Board Drop.
New 400 lb. Bement-Miles double frame Steam.
200 lb. Bradley Upright Cushioned Compact.
200 lb. Waterbury-Farrel Foundry Plain Drop.
75 lb. Belden Strap.
60 lb. Bradley Cushioned Helve.
50 lb. Beaudry Power.
40 lb. Bradley Cushioned Helve.
Three 40 lb. Gould & Eberhardt Hand Rope Drop.

GEAR CUTTERS

Three 48″ Newton Automatic Gear Cutters or Hobbers.
24″ Brown & Sharpe, cuts spur; right and left hand spirals; very latest type machine; full automatic; like new.
36″ Brown & Sharpe Automatic Hob and Spur, single pulley drive.
24″ Gould & Eberhardt Automatic Spur and Bevel.
24″ Brainard Automatic Spur.
18″ Becker-Brainard Automatic Spur.
No. 12 Brown & Sharpe Automatic Spur and Bevel.
19″ x 5″ Lees Grant Automatic Spur and Spiral Gear Hobber.

MISCELLANEOUS

WAIS & ROOS PLATE BENDING ROLLS, drop end housing, 12′ 5″ BETWEEN HOUSINGS.
No. 1 Hilles & Jones Straightening Rolls, 5′ 2″ between housings.
3″ Bethlehem Bolt Heading and Upsetting Machine.
No. 3 Newton Combination Cold Saw Cutting Off Machine, 32″ blade, on ROTARY BASE.
24″ Baker Bros. Keyseater.
16″ Saunders Pipe Machine, 8″ to 16″ capacity.
8″ Saunders Pipe Machine, 2″ to 8″.
8″ Eaton-Cole-Burnham Pipe Machine, 2½″ to 8″.
Two 6″ Curtis & Curtis Pipe Machines, 2½″ to 6″.
3½″ Acme Bolt Cutter.
3″ Acme Bolt Cutter.
17 Cut Off Machines—4″, 4½″, 5″ and 9″.
No. 2 Brown & Sharpe Surface Grinder.
10″ x 36″ Thompson Universal Grinder.
Two 6″ x 32″ Norton Plain Cylindrical Grinders.
No. 75 Heald Internal Grinder.
No. 1½ Landis Internal Grinder.
Several New "BX" Wilmarth & Morman Yankee Grinders, with cylindrical, internal, cutter, reamer and drill attachments.
21″ Gisholt Turret Lathe.
18″ Gisholt Turret Lathe.
No. 7 Bardons & Oliver Turret Lathe, chasing attachment, automatic chuck.
Three 2″ x 24″ Jones & Lamson cone head Flat Turret Lathes, chucking equipment.
350 ton Hoe & Co. Vertical Hydraulic Press, with pump and water tank, will take 34″ x 31″ between rods.
200 ton Sellers Hydraulic Wheel Press, 6′ 4″ between bars, pump.
100 ton Shaffer Hydraulic Wheel Press, pump, motor.
Four No. 114 Bliss Double Crank Inclinable Presses, 4″ stroke.
P-4 Ferracute Punch Press, 3″ stroke.
No. 3 Bliss Geared Press, 1½″ stroke.

NEW YORK MACHINERY EXCHANGE, Inc.

50 CHURCH STREET NEW YORK CITY

Machine Shops and Warehouses: Jersey City
222-234 Culver Avenue 63-83 Pollock Avenue

MACHINE TOOLS—READY FOR DUTY

BORING MACHINES—VERTICAL.
1—30" Bullard; one turret head.
2—32" Bullards, one turret head.
1—36" Bullard; two heads.
1—37" Bullard; two heads.
1—38" Bausch; two heads.
1—New 42" Gisholt; two heads.
2—10' Niles; two swivel heads.

BORING MACHINES—HORIZONTAL.
1—2½" Bar Niles.
1—Bement knee type; 2½" Bar.
1—William Sellers Knee Type; 2½" Bar.
1—Binnse Knee Type 2½" bar, for cylinder boring.
1—Beaman & Smith; 2-3" spindles.

BULLDOZERS.
1—No. 4 Ajax, 20" stroke.
2—No. 23 Williams & White Belt drive.
1—No. 26 Williams & White, Belt drive.

CRANES—TRAVELING.
1—8-Ton Chisholm & Moore 13½' span; hand power.
1—10-Ton Toledo, 3 motors, 30' span.
1—10-Ton Whiting, 48' 8" span.
1—10-Ton Shaw; 72' span; 4 motors.

CRANES—LOCOMOTIVE.
3—10-15 Ton McMyler Broad gauge, steam locomotive; 60' boom, bucket, 3 drums.
1—15-Ton Browning 8 wheel, 38' boom.
1—20-Ton Brown Hoist, 8 wheel 40' boom; bucket.
1—20-25-Ton Industrial, 8 wheel 50' boom, bucket.

CUTTING-OFF MACHINES.
1—4" Hurlburt & Rogers.
30—4½" Davis.
10—4½" Williams.
1—5" Hurlburt & Rogers.
6—8" Automatic.

DRILLING MACHINES—RADIAL.
3—NEW 3' Mueller speed box drive. March del.
3—NEW 3' American, Sensitive, Tapping Attach.
1—4' American, Speed box drive, tapping attach.
1—4' Mueller.
1—4½ Full Universal, Cone drive.
1—NEW 5' Western Plain, with motor.
3—NEW 5' Mueller speed box drive; March del.
4—6' Reed-Prentice latest type, belt driven, January del.
1—NEW 6' Triumph Motor drive. February del.

DRILLING MACHINES—HEAVY DUTY.
2—D-2 Colburn Heavy Duty 3½" cap. arranged for motor drive.
4—No. 25 Foote Burte, heavy duty, 2½" capacity.
10—No. 310 Baker single pulley drive, late type, arranged for motor drive.
10—Moline Hole Hogs, heavy duty, 2½" cap.

DRILLING MACHINES—SLIDING HEAD.
2—NEW 25" Cleveland High Duty.
5—NEW 28" Sibley.
2—NEW 30" Sibley.
2—NEW 34" Barnes;

DRILLING MACHINES—MULTIPLE SPINDLE.
1—NEW Cleveland 4 spindle Ball Bearing.
1—4 spindle 20" Barnes, all geared.
2—6 spindle Rockford, Economy type.

GEAR CUTTING MACHINES.
1—No. 1 Schuchardt & Schutte gear Hobber; spur and bevel.
1—No. 2A Newark; 24" x 8" cap.
3—No. 3 Brown & Sharpe Auto Gear Cutters; spur.
1—36" Newark.
1—30" Whiton for spur and Bevel gears.
2—36" x 9" Gould & Eberhardt; new type, spur gears.
1—15" Gleason Bevel Gear Planer.
1—20" Grant-Lees Gear Hobber; bevel spur end spiral attachment.
1—28" Rhemania Gear Hobber, spur and worm gears.
2—NEW 30 Flather Solid Pattern.
1—36" Fellows Gear Shaper.
1—36" x 10" Newark for spur gears.
1—72" Gould & Eberhardt spur and bevel.

GRINDERS—UNIVERSAL FOR CUTTERS, DRILLS, REAMERS, ETC.
5—NEW No. 190 Wells.
2—NEW Universal.
2—No. 1 Cincinnati.
1—NEW Gisholt Universal.
1—NEW Premier Universal.
1—NEW Wilmarth & Morman Style B. X.
1—NEW Walker No. 1 Outfit B.
2—NEW No. 2 Oesterlein Universal.

GRINDERS—CYLINDRICAL—PLAIN.
2—American Waltham Precision; cap. 7" x 2½".
1—NEW 8" x 30" Modern self-contained.
2—NEW 12" x 24" Modern self-contained.
4—12" x 36" Modern self-contained.
2—12" x 42" Landis self-contained.
5—12" x 48" Modern self-contained.
1—12 x 66" Landis.

GRINDERS—CYLINDRICAL—UNIVERSAL.
1—NEW Thompson 10 x 36.
1—NEW No. 3 Modern; cap. 13" x 40".
1—No. 4 Cincinnati, capacity 12 x 72".

GRINDERS—INTERNAL.
1—No. 75 Heald.
1—No. 1½ Landis.

GRINDERS—DISC.
1—NEW No. 4 Gardner including disc press, 23" disc.
3—No. 14 Besley, including ring, wheel, chucks.
1—NEW No. 17 Gardner, 30" disc.

GRINDERS—CYLINDRICAL.
1—No. 60 Heald, single pulley drive.

GRINDERS—SURFACE.
4—NEW No. 1 LaSalle Plain, with Micro. Adj.
1—NEW No. 1½ Walker's complete.
4—NEW No. 2 Reid (same as B. & S.).
1—3' Pratt & Whitney Vertical, magnetic chuck.
12—Carrigus type; mag. chuck.

HAMMERS—BOARD LIFT—DROP.
1—100 lbs. Bradley upright Beaudry type.
3—300 lbs. McWilliams.
1—No. 4 Standard Machinery Co., 400 lbs.
1—E. W. Bliss, 800 lbs.
1—1500 lbs. Toledo.
1—3000 lbs. Williams & White.

HAMMERS—STEAM—FORGING.
1—600 lbs. Niles single frame.
1—12-Ton Bement.

KEYSEATERS.
1—Morton; cap. 2" Keyways; 18" stroke.
1—No. 1 Catlin.
1—Colburn 4" capacity, 43" stroke.
1—No. 2 Knowles, 60" stroke.

LATHES—MANUFACTURING—NOT SCREW CUTTING.
2—NEW No. 3 Harding Brothers Bench Lathe.
10—NEW 26" x 12' Simplex shell bor. mills 5" Boring Bar, quick change gears; arranged for motor drive.
21—No. IX Reed-Prentice 16" swing; single pulley drive.
4—Norwood used on 9.2 English Shells.

LATHES—ENGINE.
2—NEW 12" x 5' Cleveland tool room precision geared head; taper attach.
14—NEW 15" x 6' Rockford.
3—NEW 16" x 6' Cleveland Tool room lathes, complete equipment.
1—NEW 17 x 8' National, quick change, double back gear.
12—NEW 17" x 8' Le Blond, pan bed, quick change gears.
1—18 x 8 Prentiss, geared head, taper attach. quick change.
3—20 x 8 Lodge & Shipley, quick change, turret on ways.
2—20" x 10 Lodge & Shipley, quick change.
10—NEW 21" x 10' Porter, S.B.G.
7—22" x 10' Putnam oil pan and pump.
1—NEW 24" x 10' American high duty, quick change.
2—24" x 10 Lodge & Shipley; quick change.
1—24" x 10' Schumacker & Boye quick change, taper attach.
1—NEW 26" x 48" x 12' McCabe Double spindle.
1—NEW 26" x 16' Bridgeford Pattern geared head; heavy pattern.
3—27" x 12' Bridgeford Heavy Duty, plain turning, 2 carriages, motor driven.
7—28" x 12' Bridgeport geared head; heavy duty; taper attachment.
1—NEW 30" x 14' American Double back geared; quick change.
1—30" x 14' Lodge & Davis; patent head.
1—36" x 13' Putnam face plate drive.
1—36" x 17' Pond triple geared, quick change.
1—36" x 16 New Haven, quick change.
1—36" x 20' American; triple geared.
6—40" x 18' Pittsburg, quick change gear; face plate drive.
1—42" x 4' Niles, triple geared.
1—48 x 14 Fifield.
1—54" x 22' Worcester Triple Geared.
1—58" x 18' 6" Dodge Lathe, very heavy.
1—60" x 26½" Thayer Houghton triple geared.
1—60 x 24½ American.
1—NEW 66" x 46 Putnam Triple geared, face plate drive; 5 step cone; 6½ belt; January del.
1—84" x 18' Special Boring Lathe.

LATHES—TURRET.
2—21" Gisholt, 18" chuck quick traverse; taper attach.
2—24" Gisholt; taper attach.
5—2 x 24 Jones & Lamson.
4—3 x 36 Jones & Lamson, single pulley drive.
2—18" Libby; all equipment.
3—24" Libby, universal facing head, 3 jaw chuck.
18—6A Potter & Johnson.
1—NEW 3¼" x 40" Greenlee.
1—24" Brown & Sharpe Vertical, chucking mach.
1—24" Davis.
1—No. 24 New Britain, arranged for motor drive; almost new.

MILLING MACHINES—KNEE TYPE—UNIVERSAL.
1—No. 2 Kempsmith Vertical Attach.
1—No. 2 Kempsmith 13" dividing head.
5—NEW No. 1 Kempsmith.
1—No. 1½ Cincinnati.
1—NEW No. 2 Rockford High Power.
2—NEW No. 2 Garvin.
1—NEW No. 2 Cincinnati.
3—No. 2 Cincinnati.
1—No. 2 Le Blond.
2—NEW Kempsmith, Universal.

MILLING MACHINES—KNEE TYPE—PLAIN.
1—No. 0 Cincinnati.
4—NEW No. 1 Kempsmith.
5—NEW No. 1 B Hendey with dividing heads.
1—NEW No. 2 Rockford.
1—No. 2 Cincinnati.
1—NEW No. 2 Kempsmith.
1—NEW No. 3 Cincinnati, complete.
1—No. 3 Le Blond.
1—No. 3 Kempsmith.
1—No. 15 Garvin.
1—No. 5 Cincinnati, quick change, double back-gear.

MILLING MACHINES—THREAD.
4—Morris-Thompson; arranged for motor drive.
10—No. 3 Lees Bradner.
5—No. 3C Lees Bradner for 9.2" English Shells.
2—Archdale, Taft, Pierce—for 6" English Shells.

MILLING MACHINES—HAND.
1—No. 1 Bickett.
3—NEW No. 2 Pratt & Whitney.
2—NEW No. 3 Garvin.
10—NEW Becker, table 20" x 5½".

MILLING MACHINES—VERTICAL.
1—Hilles & Jones; Heavy pattern, rotary table.
1—No. 2 Pratt & Whitney.
2—NEW No. 4B Becker.
1—Newton Vertical, continuous, motor driven, for shell work.

MILLING MACHINES—PLANER TYPE.
1—NEW 17" x 5' Eynon Planer type.
1—19" x 8' Beaman & Smith; in fine condition.
1—22" x 22" x 5' Ingersoll.
1—24" x 24 x 12' Bement & Niles.
1—24" x 24" x 14' Bement.
1—30 x 30 x 8 Ingersoll, single spindle, motor driven.

MILLING MACHINES—LINCOLN TYPE.
2—Briggs type, high duty.
3—NEW American No. 1.
1—No. 7 Becker.
2—Pratt & Whitney.

PLANERS.
2—16" x 16' x 36" Pratt & Whitney, toolroom, almost new.
5—NEW 24" x 24" x 6' Powell; single head.
1—24" x 12' Detrick & Harvey openside; one head; also mill. attach.
1—26" x 26" x 10' Gray; one head.
1—NEW 30" x 8' Powell, two heads.
1—30" x 30" x 8' Ohio; late model.
1—30" x 30" x 8' Garvin openside; fine condition.
1—32" x 32" x 16' Niles; two heads.
1—36" x 36" x 10' American; two heads.
1—36" x 36" x 12' Detrick & Harvey openside; three heads
1—NEW 36" x 36" x 10' Wilson; 2 heads.
1—36" x 36" x 8' Gray; one head.
1—36" x 36" x 14' Cincinnati; two heads.
1—42" x 36" x 14' American; two heads.
1—48" x 48" x 10' Pond; 2 heads.
1—60 x 60 x 21' Pond; three heads.
1—42 x 42 x 19' Powell; two heads.
1—62 x 62 x 20' Canada Tool Works Planer; two heads.

PUNCH AND SHEARS.
1—Waterbury-Farrell Alligator Shears, cap. 2½".
1—Cincinnati Gap Shears; 17" gap. 78" blade; ¾" capacity.
1—No. 411-G Toledo Squaring Shears; capacity 97"; weight 12,600 lbs.
1—No. 2 Hilles & Jones Punch and Shear; 30" thread.
1—Cleveland Punching Shear 36" throat, capacity 1" x ½".
1—Long & Allstatter; cap. ⅞" x ⅜".
1—Providence Steam driven punch, 48" throat, cap. 3" through 1¼"; almost new.

SCREW MACHINES—HAND.
3—No. 0 Brown & Sharpe.
1—1" Pierce.
10—NEW No. 2 Kent Owens wire feed, automatic chuck 1/4" capacity.
4—20" Cincinnati Acme friction geared head.

SCREW MACHINES—AUTOMATIC.
2—NEW ¾" Cleveland, Model A.
3—1¼" Cleveland Model B, full auto.
1—NEW 1¼" Gridley Mult. Spindle Belt Driven.
10—1¾" Gridley, Mult. Spindle; good as new.
5—2¼" Gridley Mult. Spindle, arranged for motor drive.
20—3¼" Gridley single spindle.
4—4¼" Gridley single spindle.
2—No. 0 Brown & Sharpe.
1—No. 1 Brown & Sharpe.
1—No. 2 Brown & Sharpe.
3—No. 55 National Acme.
9—No. 56 National Acme, Mult. Spindle 2¼" capacity.
1—No. 515—1/4" Capacity. National Acme; Late model.

SHAPERS.
1—NEW 16" Springfield.
1—16" Motor Driven Rockford.
1—NEW 18" Steptoe.
2—NEW 24" Milwaukee.
1—NEW 24" Potter & Johnson, Universal.
1—NEW 24" High Duty Gould & Eberhardt.
1—NEW 24" Steptoe.
2—30" Morton Draw cut.
5—NEW Barker 24".

SLOTTER
1—Wilmarth; 12" stroke.
1—New Haven; 10" stroke.

W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL., 549 Washington Blvd. CLEVELAND, O., Leader News Bldg. NEW YORK CITY, Singer Building.

Write or Wire our nearest office for quotations. This is only a partial list of available machines.

Say you saw it in THE IRON TRADE REVIEW

Milling Machines

Lot No.

1281—14-New No. 1½ American Plain.
1228—1-New No. 2 Cincinnati Plain.
1335—1-New No. 2A Garvin Univ.
993—25-New 10″ Simmons Index Centers.
1080—1-No. 2 American Univ.
469—1-No. 2 Kearney-Trecker Plain.
1253—1-No. 3 Garvin Hand Miller.
1252—2-No. 3 Cincinnati Plain.
981—2-NEW No. 3 Becker Universal.
1001—1-No. 4 Garvin Plain.
1254—1-No. 5 Becker Vertical.
1166—1-Newton Slab Miller.
312—1-New No. 1 Bickford Hand.
1317—1-New No. ½ Van Norman Duplex.
938—3-New No. 2 Hendey Miller Vises.
530—3-New No. 3 Hendey Miller Vises.
1115—1-Grant Bogart Lincoln Type.
123—1-Bement Heavy Lincoln Type.
1104—3-Pratt & Whitney Lincoln Type.
1105—3-Garvin Lincoln Type.
944—1-Van Norman Bench.
1240—1-No. 1 Garvin Hand Miller.
450—1-New U. S. Hand Miller.
1295—1-New Vertical Head for No. 1½ American Miller.
1—No. 3 Cincinnati Universal Milling Machine, complete.
1—No. 3 Le Blonde Universal Milling Machine, quick change gear complete.
1—New No. 2 Brown & Sharpe Universal Milling Machine with Slotting attachment and circular table.
1—New No. 1 Kempsmith Universal Miller.

Grinders

130—25-New Premier Cutter and Tool.
960—1-No. 3 Landis Universal.
1278—2-No. 6 Bryant Semi-Automatic.
1081—9-6 x 32″ Norton Plain.
538—1-BX Wilmarth-Morman Tool and Cutter.
743—1-Miami Univ. Tool and Cutter.
355—1-16 x 36″ Bridgeport Plain.
627—2-New No. 1 Wilmarth-Morman.
270—1-New Wilmarth & Morman.
727—1-No. 1 Blount Wet Tool.
167—1-Springfield Wet Tool.
963—1-28 x 4″ Wheel Springfield.
962—1-Brown & Sharpe Wet Grind Stone.
1312—1-New Dumore Junior Electric.
959—6-New Buffing Jacks.
1036—12-New Dumore Electric Tool.
1306—2-Walker Precision Hoods.
1310—1-No. 2 Putnam Tool and Cutter.
724—2-No. 6 Diamond Double Disc.
1297—1-Challenge Emery Stand.
1241—1-Diamond Bench Emery Stand.
545—1-New Western Emery Stand.
546—1-New No. 2 Western Emery Stand.
1243—1-Diamond Bench Emery Stand.
1300—1-New No. 3 Western Emery Stand 1″ arbor.
1298—1-No. 3 Western Emery Stand, 1 1/16″ arbor.
1299—1-New No. 4 Canedy-Otto Emery Stand, 1¼″ arbor.
1302—1-No. 3 Royal Hack Saw 9″ stroke.
1303—1-No. 4 Shop Hack Saw 5″ stroke.
1304—1-No. 7 Atkins Hack Saw 16″ blade.
1305—1-No. 3 Buffalo Double End Punch.

Planers

1215—1-24″ x 24″ x 6′ Stillman.
1012—1-24″ x 24″ x 6′ Powell, one head.
872—1-24″ x 24″ x 5½′ Lathe-Morse.
952—1-24″ x 24″ x 7′ New Haven.
906—3-25″ x 25″ x 6′ Sellers, one head.
910—1-25″ x 25″ x 2′ Sellers, one head.
1094—1-26 x 26 x 8′ D.W. Pond, one head.
1110—1-30 x 30 x 8′ Pond, one head.
1311—1-36 x 36 x 12½′ Open Side, two heads.
1207—1-36 x 36 x 20′ Putnam, one head.
1190—1-36 x 36 x 10′ Wilson, two heads.
1214—1-80 x 36 x 15′ Lincoln Planer with four heads.
1332—1-100″ x 48″ x 16′ Planer, two heads.

Lathes

1220—1-8″ x 9′ Niles Axle Lathe.
1319—1-9″ x 3″ Seneca Falls.
1233—1-9″ x 3′ Barnes.
1309—1-9″ x 24″ Bench Speed Lathe.
1308—1-10″ x 36″ Bench Speed Lathe.
1244—1-11 x 4′ Barnes Lathe.
1232—1-11 x 4′ Barnes Lathe.
1318—1-11 x 5′ Seneca Falls.
1236—1-11 x 5′ Barnes.
1238—1-12 x 4′ Seneca Falls.
1245—1-12″ x 4′ Seneca Falls.
1231—1-13″ x 4′ Warner-Swasey.
1230—1-13″ x 4′ Warner-Swasey.
1296—1-13 x 5 Barnes.
929—6-New 13 x 5′ Lancaster.
1239—1-13 x 6′ Fay & Scott.
1112—1-New 13 x 6′ Fay & Scott.
1221—1-14″ x 5′ Putnam.
1145—2-New 15″ x 6′ Sidney Tool Room.
1142—1-16 x 6′ American.
718—1-16 x 6′ Draper.
701—2-16 x 8′ Putnam.
1223—1-16 x 8′ Fitchburg.
1257—10-16 x 8′ Simplex Single Pulley Drive.
1180—1-18 x 8 Flather.
1185—1-18 x 8 Porter.
1144—1-18 x 8′ Reed.
1168—1-18 x 8′ Reed.
448—1-20 x 8′ Pond.
528—1-20 x 8′ Harrington.
720—1-20 x 6′ Reed.
1329—1-20 x 10′ Putnam.
1328—1-24 x 10′ Reed.
1216—1-24 x 12′ Porter.
1149—1-New 25″ x 18′ Sidney.
1131—1-26″ x 13½′ Bullard.
1246—1-26″ x 18½′ Bullard.
1275—1-30″ x 28′ Niles.
1280—1-32″ x 56″ x 12′ Fay & Scott.
482—1-32 x 12′ Draper.
1322—1-36″ x 16′ Gleason.
1323—1-48″ x 21′ Fifield.
1056—1-Large Pit Lathe 9′ face plate.
1330—2-2½″ x 36″ Marvel Lathes.
942—1-Jenckes Band Turning Lathe.

Shapers and Slotters

1210—1-24″ Bement Slotter.
1320—1-12″ Gould-Eberhardt Back Geared Shaper.
522—1-12″ Bement Traveling Head.
1217—1-14″ Walcott Shaper.
1224—2-14″ Hendey Friction Shapers.
1208—2-18″ Hendey Friction Shapers.
1120—6-NEW 20″ Cleveland Shapers.
1066—1-28″ Smith-Mills Crank Shapers.

Drilling Machines

1333—1-3′ Universal.
1219—1-5′ 6″ Niles.
1258—1-6′ Bickford.
1052—1-Rockford Heavy Duty.
947—1-New No. 51, 3½′ Canedy-Otto Post Radial.
1193—3-New No. 101, 3½′ Canedy-Otto with base.
1196—4-New No. 46, 20″ Canedy-Otto Stationary Head.
995—4-New No. 35, 20″ Canedy-Otto Stationary Head.
1251—1-20″ Blaisdell, Sliding Head.
1327—1-24″ Aurora, Sliding Head Drill.
1325—1-24″ Snyder, Sliding Head.
1326—1-36″ Snyder, Sliding Head.
580—1-36″ Aurora, Sliding Head.
917—1-40″ Industrial, Stationary Head.
1057—1-New No. 1 Sipp High Speed Sensitive.
1242—1-Burnham, High Speed.
888—1-Burnham, 3 spindle.
1172—1-Burnham, 3 spindle ½″ cap.
1274—1-New Foot-Burt, 4 spindle.
1268—6-New Heckman 3/16″ capacity.
1060—1-Rockford 6 spindle.
949—1-New Dumore Electric.
1240—1-Garvin Friction Bench.
10—New No. 35 Canedy-Otto Drills, new, immediate delivery.

Automatics

924—1-¾″ Spindle Nat. Acme.
935—1-1″ four spindle Nat. Acme.
936—1-No. 54 Nat. Acme 1¼″ Cap.
927—2-No. 55 Nat. Acme 1⅝″ Cap.
1161—3-2″ Cleveland Model A 5 hole turret.
566—2-2″ Cleveland, 5 hole turret.
585—1-2¾″ Cleveland, 5 hole turret.
584—2-2¼″ Gridley Single Spindle.
585—1-3¼″ Gridley Single Spindle.
586—1-4¼″ Gridley Single Spindle.
1313—2-No. 0 Brown & Sharpe.

Screw Machines and Turret Lathes

1321—1-No. 1 Berdon-Oliver Screw Machine.
1014—1-New No. 2 Leisy-Patton Hand Screw Machine.
1234—1-Brown-Sharpe Turret Lathe.
1301—1-Pratt & Whitney Hand Screw Machine.
966—1-20″ x 6′ Perkins Turret.
173—1-20″ x 8′ Bridgeport Turret.
1179—1-Conradson Turret.
1225—1-2″ x 24″ J. & L. Cone Type.
1226—1-2″ x 24″ J. & L. Cone Type.
1227—1-2″ x 24″ J. & L. Cone Type.
967—1-3¼″ x 36″ J. & L. Chucking Lathe.
1337—1-No. 0 Brown & Sharpe Screw Machines.

Miscellaneous

993—25 New Simmons 10″ Index Centers.
1255—1-Brown-Sharpe Gear Cutter.
1184—1-2½″ Acme Bolt Cutter.
1315—1-No. 20 Bliss Inclinable Press.
1318—1-No. 4 Inclinable Press.
394—1-No. 55 Bliss Press.
1147—1-No. 30 Bliss Arched Power Press.
1160—1-Dedrick Punch and Shear.
939—2-Errington Tapping Attachments.
885—1-3″ Curtiss Cutting Off Machines.
942—1-Jenckes Band Turning Lathe.
941—1-West Hydraulic Banding Machine.
1008—50-New 4″ Univ. three jawed scroll chucks.
598—1-New 25 H. P. Morristown Gas Engine.
1267—1-Whiton Centering Machine.
1222—1-42″ Niles Car Wheel Borer.
1250—1-Hand Slitting Shear.
1334—1-Reed Punch and Shear.
340—3-New No. 1 Racine Hack Saws.
954—1-No. 2 Armstrong Hack Saw.
955—1-No. 5 Royal Hack Saw.
1218—1-New Peerless High Speed Hack Saw.
1324—1-4″ Cockran-Bly Saw.

6—New No. 2 Brown & Sharpe Automatic Turret Forming Machines.

SIMMONS MACHINE COMPANY, Inc.

MAIN OFFICE AND WAREHOUSE:

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Here's the Equipment You Want

IMMEDIATE DELIVERY—GOOD WORKING CONDITION

SLOTTERS

18" Betts, heavy type—circular table.
10" New Haven.

LATHES

60" x 11' New Haven Pulley Lathe, two 48" face plates.
Six (6) 40" x 18' Pittsburgh Lathes, quick change gear.
32" x 20' Rahn Larmon.
24" x 12' Lodge & Shipley.

VERTICAL BORING MILLS

50" Bridgeport Bullard.
48" Colburn, 2 swivel heads.
Two (2) 42" Colburn, single head.

PLANERS

40" x 40" x 14' New Haven, single head.
30" x 30" x 12' Cincinnati, 2 heads.
Two (2) 30" x 30" x 10' Pease, single head.
25" x 25" x 8' Sellers, single head.
24" x 24" x 6' New Haven, single head.
42" x 42" x 12' Pond Planer. 1 head on rail, 1 side head.
30 x 30 x 8' Powell Planer, 2 heads.

RADIAL DRILLS

60" Hamilton.
48" Gang, tapping attachment.
48" Niles.

GRINDERS

No. 5½ Bath Duplex.
No. 3 Bath Universal.
12 x 60" Landis Universal.
No. 2 Bath Universal.
10 x 30" Atlas Universal.
Two (2) No. 2½ Bath Duplex, internal.
No. 11 Landis Plain.

MILLING MACHINES

Two (2) Newton Vertical Milling Machines, 6" main spindle; equipped with 36" heavy facing cutter heads.
No. 5 Brown & Sharpe Vertical.
No. 1½ Cincinnati Universal, dividing heads, etc.
No. 2 Putnam Universal, dividing head, etc.
No. 2½ Garvin Universal, dividing head, etc.
No. 2 Le Blond Plain.

GEAR CUTTERS

16" Bilgram Bevel Gear Planer.
Wm. Sellers Son, 54", Spur and Bevel.
Brown & Sharpe 24" Automatic.

PRESSES

No. 54 Garrison Straight Sided Single Crank Press, weight 26,000 lbs., 5" stroke, 25" between housings.
93-A Toledo, weighs 14,000 lbs.
92-B Toledo, weighs 9,400 lbs.
No. 35 Arch Press, weighs 5,000 lbs.
No. 3 Perkins double action Toggle Press.
150-Ton Ferracute Knuckle Joint Coining Press.
75-Ton Ferracute Knuckle Joint Coining Press.

POWER HAMMERS

15-Ton Morgan Steam Hammer.
1000-lb. Billings & Spencer, Board Drop.
Two (2) No. 4 Nazel Pneumatic.
500-lb. Bell Single Frame Steam.
500-lb. Bradley Upright.
400-lb. Ferris & Miles Steam.
200-lb. Beaudry Upright.
Two (2) 200-lb. Bradley Upright.
One (1) 40-lb. Bradley Helve.

UPRIGHT DRILLS

36" Foote-Burt heavy duty
26" Barnes.
24" Foote-Burt.
24" Prentice.

PIPE MACHINES

8" Eaton, Burnham & Cole.
6" Jarecki.

CRANE

15-Ton Alfred Box & Co., Traveling Crane, single motor, 15 H.P., 220 volts, 40' span.

MISCELLANEOUS

10' Hilles & Jones Boiler Plate Rolls.
No. 3 Newton Cold Saw.

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GRAVES MACHINERY EXCHANGE

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MACHINERY

Tool Room and Production Machinery, which is all in good condition, is offered subject to prior sale for immediate delivery. Also quantity of Machinists' Tools and Supplies, High Speed Steel, Electrical Wires and Cables, Shop Fixtures, etc.

LATHES

4—26 in. x 12 ft. Putnam "Pacific Coast Type" Lathes, motor driven.
1—27 in. x 12 ft. "Bridgeford" Heavy Duty Plain Turning Lathe arranged with two carriages, motor driven.
2—27 in. x 12 ft. Huntington Machinery & Foundry Co. Special Lathes, motor driven.
5—"Norwood" Lathes, 26 in. x 12 ft.
4—"Norwood" Lathes, 24 in. x 8 ft.
4—Fairbanks-Morse Co. Engine Lathes.
1—Blaisdell 16 in. x 6 ft. Screw Cutting Engine Lathe.
1—Blaisdell 18 in. x 8 ft. Screw Cutting Engine Lathe.
5—Oliver Bench Lathes, 8 in. x 36 in.

DRILL PRESSES

1—26 in. "Aurora" Drill Press, motor driven.
4—"Special" Drill Presses (Baker Type).

CUTTING-OFF MACHINES

2—Williams Tool Co. Cutting-Off Machines.

AUTOMATIC CHUCKING and TURNING MACHINES

17—No. 6A "Potter & Johnson" Automatic Turning Machines; 9 are motor driven.

MILLING MACHINES

2—"Briggs" High Duty Milling Machines.
8—No. 3D "Lees-Bradner" Thread Milling Machines.
5—No. 3C "Lees-Bradner" Thread Milling Machines.

GRINDERS

3—O. S. Walker Tool Grinders.
1—No. 2 "Blount" Grinding Machine.
1—No. 3 "Blount" Grinding Machine.
9—20 in. "Blount" Improved Wet Tool Grinding Machines.
2—20 in. Whitney Water Tool Grinders.
1—No. 1 Plain "Wilmarth & Morman" Surface Grinder.
1—Wilmarth & Morman Style P Drill Grinder.
1—Gisholt Tool Grinder.
1—Diamond Machine Co's. 12 in. Face and Angle Grinder.

SCREW MACHINES

1—2 in. Plain Cleveland Automatic Single Spindle Screw Machine.
1—⅞ in. Plain Cleveland Automatic Single Spindle Screw Machine.
1—Jones & Lamson 2 in. x 24 in. flat turret hand Screw Machine.

MISCELLANEOUS MACHINERY

2—Gas Furnaces 26 in. x 30 in. x 12 in.
1—"American" High Pressure Blower.
1—No. 60 "Victor" High Pressure Blower.
1—No. 47 "Connorsville" Blower.
1—No. 5A High Speed Special Hammer.
1—No. 5 Oil Separator (National Separator & Machine Co.)
2—No. 4—12-cylinder Banding Presses—West Tire Setter Co.
1—3 in. Rogers & Hulbert Metal Cutting-off Machine.
1—Dovetailing Machine—J. A. Fay Co.
1—Braiding Machine.

ELECTRIC MOTORS

1—1 H.P. G. E. Type RC4 Form A2, 230 Volt D.C. Motors.
1—1 H.P. G. E. Type DSD, 230 Volt D.C. Motor.
1—3½ H.P. C. & C. Electric Co's. Type 2SL, 220 Volt D.C. Motor.
1—7½ H.P. C. & C. Electric Co's. Type S, 220 Volt D.C. Motor.
1—7½ H.P. Stanley Electric Co's. 220 Volt D.C. Motor.
2—10 H.P. Allis-Chalmers Type K, 220 Volt D.C. Motors.

POWER STATION EQUIPMENT

Capacity 250 Kva., 11000/230 Volt, 3 Phase, 25 cycle as follows:
1—Transformer, Westinghouse 3 Phase, 250 Kva., 11,000/230 Volts, 25 cycles.
2—Switch Board Panels equipped with one each as follows:—
I.T.E. Automatic Circuit Breaker, 3 Pole, 600 Amp. 230 Volts, Type LL 1167.
Crouse-Hinds 3 Pole, Single Throw Knife Switch, 600 Amp. 250 Volts.
1—Watthour Motor Westinghouse 300 Amp. Polyphase Type A.O. 25 Cycles, 220 Volts.

MISCELLANEOUS

1—2000 lb. Type W1 Sprague Electric Hoist.
94—Ford 500 lb. Chain Hoists with trolleys for 7 in. beam.
20—500 lb. Euclid Type "E" Plain Trolley Electric Hoists.
13—500 lb. Sprague Electric Hoists with trolleys for 7 in. beam.
20—Shepard 500 lb. Electric Hoists.

All machines are belt driven unless otherwise specified. Detailed List on Application.

GENERAL RAILWAY SIGNAL COMPANY, Rochester, N. Y.

THINGS MOVE QUICKLY

We may not have your wants to-day, but will to-morrow. Even though your needs are not listed, we may have them. *Write.*

1—**No. 2 B. Hendy Universal Milling Machine,** single pulley drive vertical attachment, dividing heads and vise.

1—**No. 2 Le Blond Universal Miller,** with vertical attachment.

1—**No. 2 Becker Brainard Plain Miller,** with vise, all power feed.

1—**No. 1 Brown & Sharpe Plain Miller,** goose neck arm.

1—**24 x 12 Lodge & Shipley Lathe,** quick change gear, compound rest.

8—**3 x 36 Jones & Lamson Flat-top Turret Lathes.**

9—**2 x 24 Jones & Lamson Flat-top Turret Lathes,** geared head.

1—**18 x 8 Morris Lathe,** quick change gears, double back geared, compound rest, power cross feed.

2—**14 x 6 Carroll Jameson Lathes,** double back gear, quick change feed.

1—**No. 3 V. & O. back-geared Power Press.**

1—**20" Back-geared Smith & Mills Shaper.**

1—**16" Steptoe Shaper.**

1—**16" Lodge & Davis Shaper.**

1—**16" Brown & Sharpe Cylindrical Grinder** 10½ x 72, with full equipment.

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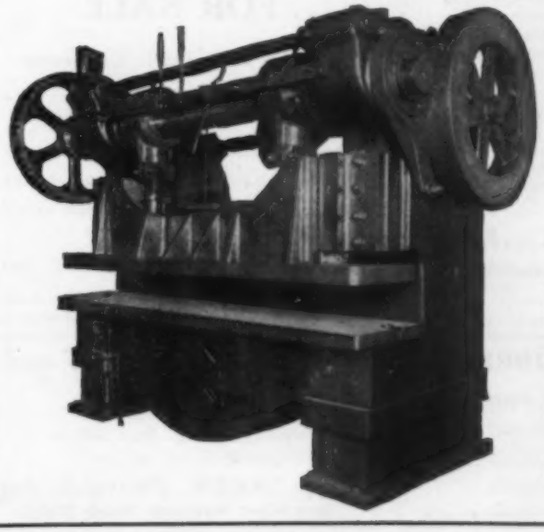

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200	Kw	Gen'l Elect.	Speed	425
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40	Kw	C & C	"	250
30	Kw	Westinghouse	"	1150
10	Kw	"	"	1135

125 Volt D. C.

37½	Kw	Westinghouse	Speed	900
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15	Kw	"	"	1150
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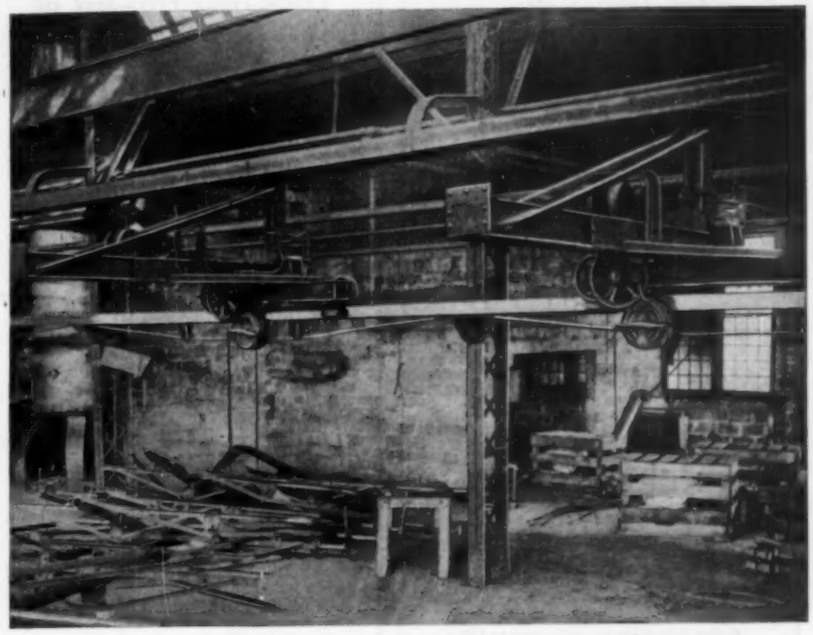

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800 Lineal feet Runway for 5 ton ELECTRIC Crane.
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1—300 KW AC, 60 cycle, 3 phase, 2300 volt, three bearing belted.

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1—10 HP, 115 volt, 1050 rpm, Ideal motor with Cutler-Hammer starter.
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1—500 HP, 2300 volt, 25 cycle, 3 phase, sychronous motor.

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18,800'-24" gauge 20 lb. portable track.
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USED BOILERS

2—160 H. P. Geary Water Tube Boilers with equipment including stacks, 150 lbs. pressure.
2—300 H. P. Sterling Boilers with equipment including stacks, 150 lbs. pressure.
4—440 H. P. Babcock & Wilcox Boilers with superheaters and equipment (new) 225 lbs. pressure.
1—72" x 16'0" H. R. T. Boiler with equipment, 150 lbs. pressure.
Boilers, Compressors, Generators, Motors.

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Direct Connected Units!

Which we offer, immediate delivery.

A. C.

3—375 KVA. WITH COMPOUND ENGINES.
1—250 K.W. with Compound Engine.
1—200 K.W. with Compound Engine.

D. C.

3—800 K.W. 250 V., Compound Engines.
2—800 K.W. 250 V., Simple Engines.
1—300 K.W. with Compound Engine. 250 V.
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1—130 K.W. 250 Volts, Gas Engine Unit.
2—100 K.W. 250 Volts, Compound Engines.
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2—800 K.W. 550 Volts, Simple Engines.
1—250 K.W. Belted Generator, 550 Volts.
1—60 K.W. and 1—50 K.W. Belted Generators, 250 V.

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1—10 x 24" Hamilton.
1—12 x 30" Hewes & Phillips.
2—16 x 36" Wetherill and Watts-Campbell make.
1—16 x 42" Bates, Heavy Duty.
1—22 x 48" Brown.
1—30 x 42" Penna. Iron Works Rolling Mill type.
1—34 x 60" Allis Chalmers, Cross Comp. Condensing.
1—18 x 36 x 42 and 1—20 x 40 x 42" Allis Chalmers Cross Comp. Condensing Engines.

BELTING

3—Main Belts, 30" face x 100' long.

PUMPS

1—8 x 8 Deming Triplex Double Acting brass fitted with Clutch Pulley.
1—6½ x 8 Dean Double Acting Triplex.

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THE IRON TRADE REVIEW, Cleveland, O.

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1—26" x 16' Bridgeford Lathe, patent geared head, heavy pattern. New.
2—15" Hendey Shapers. New.
1—Cleveland Automatic Screw Machine. New.
1—5A Potter & Johnson Turret Machine. New.
1—16 x 48 Landis Crankshaft Grinder. New.
1—100 Ton Watson-Stillman Hydraulic Wheel, Press, hand power. New.
1—Manville Hopper Feed Thread Rolling Machine. New.
1—36 x 36 x 14' Cincinnati Planer, with two heads, Used.

We have many others.

Send for our list.

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38 Park Row New York, N. Y.
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36-INCH BEMENT ROTARY PLANER

Mounted on swivel base with 6-ft. travel arranged for belt or motor drive. Very fine condition.

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to advertise here, so we've issued Bulletin 227
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Rails, Equipment, Machinery, Piling, Tanks

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Consists of

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Cylinder Gas Furnace
Oven Furnace
4 Oil Tempering Furnaces
Oil Cooling Tank
Pyrometer
Lead Melting Pot
Blacksmith Furnace
Optical Pyrometer
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Scleroscope

Located at Jersey City, N. J.

WICKES BROS.
Saginaw, Mich.

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250 lb. Beaudry Belt Driven Power Hammer.
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Bertsch Motor Driven Bending Roll ¼" x 10'.
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1—150 K. W. 500 Volt General Electric Generator, direct connected to a Clark Corliss Engine. First-class condition, for immediate shipment.

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Spot Cash

For Used Machinery, Tools, Etc.

Mail your list stating age, make and condition of items offered.

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Wanted

Vertical boring mill — two swivel heads — about 42". Must be a standard make machine in good as new condition. Send complete description with reply.

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Foundry Equipment Wanted

Including cupolas, ladles, tumbling barrels, etc. Quote price and state condition.

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WANTED

For Immediate Delivery

1—2000 KW. (or 3000 KW., A. C. Turbo-Generator, Turbine for 150 lbs. steam pressure. Generator for 600 volts, 3-phase, 60 cycle current. To include condenser, water and air pumps and motor generator exciter set.

1—500 KW., D.C. Turbo-Generator. Turbine for 150 lbs. steam pressure. Generator to be compound wound, for 220 volts. To include condenser, water and air pumps.

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DYNAMOS

We pay highest spot cash prices.

Write at once what you have for sale.

ANY SIZE OR KIND

Quick Action

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204-206 Centre Street, N.Y.

HERE'S THE PLACE TO

Quickly Sell

OR ADVANTAGEOUSLY BUY ALL KINDS OF

Used Equipment

SAVE TIME AND MONEY BY MAKING YOUR WANTS KNOWN THRU

Second Hand Machinery Department

THE IRON TRADE REVIEW
CLEVELAND, OHIO

20

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WANTED

Cupola Cast Scrap
also
Heavy Melting Steel

For Pittsburgh and Valley Districts

Write or Wire

Mine Locomotives

Wanted

Six and eight-ton 36-inch gauge, 250 volt, direct current, Mine Locomotives, immediate delivery.

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WANTED

Combined Stake Punch and Riveter in good condition. Must have stake at least 24" long. Give full particulars as to punching and riveting capacity of machines offered.

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WANTED

300 Ton, 1" thick x 4", 5", 6", 7", 8" or 9" wide, and 1⅛" or 1¼" thick x 6", 7", 8" or 9" wide, flat bar steel or iron. Advise condition and best price.

Address Box 997
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EQUIPMENT WANTED

We are in the Market for the Following Machinery and Appliances, New or Secondhand.

One—3 or 5 ton ELECTRIC STEEL FURNACE, with transformers and other necessary equipment.

One—Twelve inch, three high, Bar ROLLING MILL, with steam or electric drive, furnaces, tools, etc.

One—5 ton double frame STEAM HAMMER.

One—3 ton double or single frame STEAM HAMMER.

One—1 ton double or single frame STEAM HAMMER, together with boiler, furnaces and tools for above.

Communications regarding the whole or any part of above, must state price, delivery, condition and where can be seen, together with any other information that is likely to be of service, and should be addressed to

The Toledo Electric Steel Organization
TOLEDO, OHIO

WANTED:—What do you want?

Equipment of all kinds is mighty scarce but someone of the many readers of THE IRON TRADE REVIEW can fill your wants if you will let them know about your requirements.

"We secured the crane from a concern right in our own city. They failed to see our local advertisement but when they wanted to sell, they went to your magazine."

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These two letters were received from advertisers who were badly in need of equipment. Their advertisements appeared in two issues, bringing gratifying results, as their letters indicate.

Someone always wants to buy or sell. Make YOUR wants known to the readers of THE IRON TRADE REVIEW and they will be quickly taken care of.

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Do you consult these advertisements when you have orders to place—

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The service of THE IRON TRADE REVIEW is at your command when your buying problems are of an unusual character.

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Fill-in and Contract Work

Where orders may be secured for stampings, iron, steel or brass castings, dies, tank and boiler work, construction of special machines, building of patterns and models, experimental work, etc.; where special work may be secured for prompt delivery.

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RATES FOR LARGER SPACE OR LONGER PERIODS FURNISHED ON REQUEST

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We can devote a portion of our capacity to outside work. Send us your specifications for quotation.

Accurate work guaranteed.

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Are What We Like

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Automobile and Airplane Parts

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Wellman Bronze Oil Grooved Bushings of every description.

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General Catalogue No. A-7.

Patternmakers Electric Tool Bulletin No. 8.

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as well as Munitions in any quantity.

Send B/P for attractive quotations.

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Our modern factory is fully equipped for turning out PROMPTLY work of above nature.

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Deep Metal Drawing, Metal Stamping, Spot Welding.

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We can arrange for a few tons additional production for 1918.

FULLER & WARREN CO.
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you may need in the iron and steel field can be obtained by putting a classified ad in

THE IRON TRADE REVIEW

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Foundry located in Wisconsin. Now making castings for turret lathes, screw machines, milling machines, grinders, steam turbine engines, etc. Can handle four or five tons per day from 1 pound to 10,000 pounds. Everything in Grey Iron Castings.

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Shafting lathes up to 30 feet long 18" swing over carriage

Special Machine Work of all kinds
Our Own Foundry

Send us your inquiries

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Bellefontaine, O.
High grade
Gray Iron Castings
Prompt Deliveries.
Automobile fly wheels and brake drums a specialty.
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Products of
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THE METAL MACHINING TOOL CO.
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For building special machinery.
Special gasoline and steam motors, etc.
Let us figure with you.
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Wood and Walnut Sts., Chicago, Ill.

Tools, Dies, Jigs & Fixtures
Light Machine Work
Send us your blue prints for estimate.
MODERN MACHINE COMPANY
Bellefontaine, Ohio

GRAY IRON CASTINGS
Brass and Aluminum Castings
Machine Work
We make a specialty of cylinder castings and light work up to 3000 lbs.
The Brown Clutch Co., Sandusky, O.

The C. C. Foudree Co. MIDDLETOWN OHIO U.S.A.
"DURO" Pure Iron
Manufacturer of "Duro" Rust Resisting Silos and Tanks. Equipped to produce 7 to 27 Gauge. Sketches-Circles-Flanged Heads, Angles Channels. In and out angle rings, stamping, acetylene welding. Let us quote on your specifications, please.

H. K. BRONZE
FOR BEARINGS
Write us today
BRASS FOUNDRY ASSOCIATION
711 S. Adams St., Peoria, Ill.

GRAY IRON CASTINGS
With Merit
The Simpson Foundry Co.
Established 1895
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Stamping and Drawing
Dies, punches and special tools.
Special equipment to manufacture all kinds of specialties.
Gem Mfg. Company
Goebel and Fulton Streets, North Side
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Bellwood, Pa.
Grey Iron Machinery and Engine Castings up to 5000 lbs.
Quality and service guaranteed.

We are looking for outside work for our
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Brass, and Gray Iron Foundry
Send Blue Prints for estimates.
Klotz Machine Co.
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(Punch press work)
TREADING, etc. (Bolt cutter work)
WOOD PATTERNS
Our service to you is backed by experience of 35 years.
THE WILLIAM BAYLEY CO.
Box IT SPRINGFIELD, O.

WANTED
Heavy and light Sheet Iron also Machine and Foundry Work.
Mail specifications which will have our prompt attention.
The Overholt Machine Co.
Seville, O.

Metal Stampings
DIES TOOLS JIGS
Let Us Estimate on Your Work
LANSING STAMPING & TOOL CO.
Dept. A LANSING, MICH.

The Colonial Iron Works Company
WE WANT TO FIGURE ON YOUR WORK
SEND US YOUR PLANS AND SPECIFICATIONS
STEEL SHEET, PLATE AND STRUCTURAL WORK
881-885 E. 67th Street CLEVELAND, OHIO.

WHEN you have work to sublet consult these advertisers. If you don't find what you want—ask us.
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Manufacturing Engineers
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Pattern Work
Estimate Furnished.
Monongahela, Pa. (Pittsburg District)

Pattern Work
Wood, Brass, or Aluminum Patterns.
Accurate work. Prompt Delivery.
Marion Malleable Iron Works
Dept. P. S. Marion, Indiana

Stamping and Forming
Plating and General Metal Work
16,000 sq. ft. Machinery, Power and labor at your service. Send samples or write for estimates. Quick service guaranteed.
THE CONWAY STOVE CO., Bellevue, O.

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Gear blanks, bars, rods, shafting.
How you want them.
When you want them.
JOLIET FORGE CO.
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CONTRACT WORK!!!

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Start paving the way to bigger business by letting the Fill-In and Contract Work Department of THE IRON TRADE REVIEW serve you.

The readers of THE IRON TRADE REVIEW are just the men you want to interest—the men of big affairs in the iron, steel, foundry, machinery and metal-working industries; the men upon whom falls the responsibility of direction and management.

Why not interest them now?

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SEND YOUR SPECIFICATIONS SAMPLES OR BLUE PRINTS HERE

With our Associated Machine Shops, Foundries, Assembling and Manufacturing Plants—located in all parts of the United States—with *Equipment comprising thousands of Machine Tools, and employing thousands of Skilled Mechanics, and the necessary complement of Managers, Designers and Draughtsmen—we can guarantee*

EFFICIENCY ECONOMY *and* DELIVERY

FOUNDRY WORK

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DROP FORGINGS, PUNCH PRESS WORK, METAL STAMPING, METAL SPINNING, DIE CASTING, OXY-ACETYLENE WELDING, AND CASE HARDENING

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TOOLS, JIGS, FIXTURES, DIES, AND EXPERIMENTAL WORK

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WOOD AND METAL

SCREW MACHINE PRODUCTS, LARGE WORK, SMALL WORK, PRECISION WORK, AND GENERAL MACHINE WORK

PROMPT ATTENTION GUARANTEED

CO-OPERATIVE ENGINEERING COMPANY

50 CHURCH STREET, NEW YORK CITY

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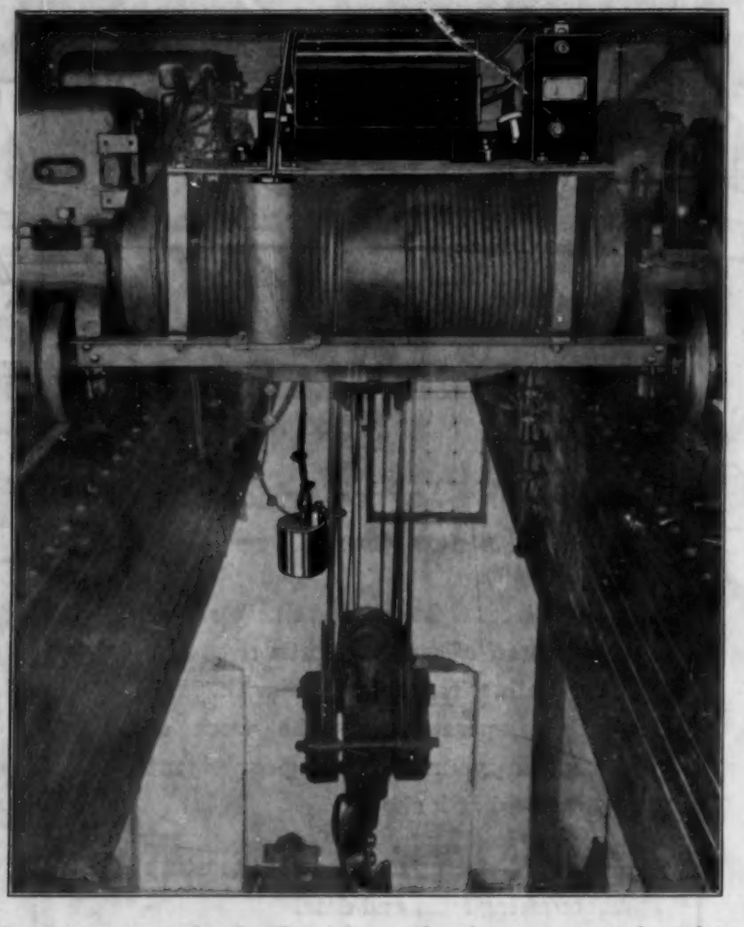

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